Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres. and Treas. ROB'T MCKEAN, Sec'y.
505 Pearl St., New York.
6 Bouverie St., London, E. C.
Unter den Linden 71, Berlin.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

During 1910 *we printed and circulated* 526,500 *copies of* THE ENGINEERING AND MINING JOURNAL.

Our circulation for February, 1911, *was* 40,750 *copies.*

March 4..... 11,000
March 11..... 9,750

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE

Editorials:
Freight Rates on Coal..... 501
Shaft Sinking and Crosscutting..... 502
Zinc Ore Market..... 502
Scientific Management..... 503
The Railroads and the Iron Markets.. 503
Prospecting for Potash..... 503
New Reef on the Rand..... 504

Correspondence and Discussion: Peculiar Mexican Laws Affecting Mining Officials.... The Postage Question.... Mining in Ketchikan, Alaska.... Review of Cyanidation....Zinc Ore at Joplin....Americans Safe in Mexico....California Gold Production..... 505

Details of Practical Mining: *An Automatic Mine Car Tally.... *Timbering Swelling Ground.... Analyses of Converter Fume.... Ignition of Sulphide Ores....*Cable Clamp for Tramway.... Silica Sponge....Prevention of Dusting on Concrete Floors.... *Determining Total Output in Tons per Hour.... 507

Report of Yukon Gold Company..... 511
Mineral Production of Canada. *John McLeish* 512
Canadian Mining Institute..... 513
Power Plant for Porcupine..... 513
Sinking and Driving at Argonaut. *R. S. Rainsford* 514
Lake Superior Iron Ore..... 516
Scientific Management of Work. *Arthur W. Page* 517
Selling American Mines in London. *F. Close* 519
*New Mill at Nevada Wonder Mine. *P. E. Van Saun* 520
Pulmonary Diseases among Miners. *Frederick L. Hoffman* 523
Wages in the Iron Districts..... 526
Safety Lamps and Firedamp..... 527
*Details of Colliery Trestles. *A. T. Shurick* 528
Spraying Coal Dust with Soap and Water.....*Special Correspondence* 531
*A New Metallizing Process. *A. Gradenwitz* 532
January Operations of Goldfield Consolidated..... 533
Water for Miami Mills..... 533
Porcupine Developments..... 533
Anaconda Smoke Decision..... 533
Personal, Obituary and Societies..... 534
Editorial Correspondence..... 535
Mining News..... 537
Markets..... 542

Illustrated.

The Engineering and Mining Journal

MARCH 11, 1911.

Freight Rates on Coal

The prevailing conditions of very large production of coal and active competition in its distribution and sale have brought about much discussion of the question of railroad rates, which has an important bearing on the competition of different districts for trade. The immediate result has been the filing of several complaints with the Interstate Commerce Commission, and the preparation of several others which will soon be submitted. All of these complaints charge discrimination and inequality in rates; alleging that they are so graduated that the more favorably placed districts derive no advantage from their situation and nearness to markets; and even in some cases are placed at a disadvantage in comparison with mines having a much longer haul to market. Most of these complaints are supported by tables showing the rates per ton-mile from different coalfields. These certainly show some striking differences, and on their face indicate that great discriminations exist in railroad practice, if the absolute distance or ton-mile basis is alone to be considered.

In most of the computations of ton-mile rates, the contrasts are usually rather greater on paper than in reality, because they ignore the terminal charges. Coal is a commodity which is not usually subject to reloading or transhipment on the way. The coal car goes through from the mine to the terminal or other consuming point, and the unloading or terminal charge is very much the same on a 100-mile as on a 500-mile haul. It is therefore a sort of fixed charge which ought to be deducted before the ton-mile rate is computed; but this is not generally done, and so far the comparisons are inexact. The differences, however, would not greatly change the contrasts made.

The question of railroad rates is one of great difficulty and requires too much study and discussion to enter into here. It is a general maxim, however, that a railroad is justified in making a low rate to build up a traffic which otherwise could not exist; and that a very small margin of direct profit on a rate can be carried where the bulk of business is large, and where it brings in and builds up other and more profitable trade. This has been preëminently the case with the West Virginia coal trade. The coal industry of that State has been built up and supported by low rates; but these are not too low to prevent the railroads from earning some profit, and the growth of the industry has brought in a large population, requiring also the haulage of food and supplies of all kinds, on which there is a substantial profit. It is noticeable in all the rate complaints filed that West Virginia is the main disturbing element in both the western and the seaboard coal trade; and this is a fact which has been well known for years past. The high quality of much of the West Virginia coals, the non-union basis on which much of the mining is done and the lower cost of mining have combined with low railroad rates to give its operators advantages which they have not been slow to take.

The most striking contrast in coal rates of which we have any knowledge is not, perhaps, directly applicable to the questions now at issue. The ton-mile rate on anthracite coal from the Wyoming Valley to tidewater at New York harbor is 3.6 times that on Pocahontas and New River coal from their respective basing points to tidewater at Hampton Roads. The application of the anthracite basis to New River coal, for instance, would absolutely shut it out of the eastern market. This comparison, however, is not a fair one, since the anthracite trade stands by itself in its special market, in its methods and in the close control of production and sales.

Setting aside this contrast and making comparisons on bituminous coal alone, we find that the ton-mile rate on Clearfield and Cumberland coal to tidewater is about twice as great as on New River. This places the West Virginia coals about

on an equality in the seaboard trade with those of Maryland and the central districts of Pennsylvania. The rate on Pocahontas coal to tidewater is the lowest anywhere in this country, being about 0.23c. per ton-mile on an average haul of nearly 400 miles. On this rate the railroads evidently secure some profit, for they make constant efforts to increase their trade.

Almost equally sharp contrasts are found in the Western trade. The ton-mile rate from the Pittsburg district and Eastern Ohio to Lake Erie ports is 2.25 times that on New River coal; and to Chicago there is a great discrepancy. Such instances of variation in the ton-mile rates can be multiplied, but those given will be sufficient for the general field.

To take a narrower field and one where there is less question of quality, we find that the ton-mile rate from the Danville group of mines in Illinois to Chicago is nearly 45 per cent. higher than that from the Springfield group, and 66 per cent. above that from Southern Illinois. These differences have been passed upon and allowed by the Illinois Railroad Commission. Were these rates to be equalized on the ton-mile basis, there would be an advance of 38c. in the rate from the Springfield mines and of 68c. from the Southern group; and these differences, under the existing conditions of competition, would be sufficient to shut the coal out of the Chicago market. That market would then be entirely in the hands of the Northern Illinois and Western Indiana operators, so far as they were able to supply it; a condition which would be profitable to them, without doubt. But where would the consumer come in?

Only a little consideration is required to show that a readjustment of coal rates on the basis of ton-mile charge alone is impossible; that it would disorganize not only the coal trades, but manufacturing business, which is almost everywhere dependent upon its fuel supply. The Interstate Commission certainly has a most difficult proposition before it—the various coal-rate complaints. How far should other considerations be allowed to overrule that of distance or length of haul? It is probable that when the complaints are taken up the Commission will not attempt to lav down any general principle, but will try to decide each complaint on what seem to be its merits. It is quite certain that it can render no decision that will satisfy all parties, or that will do away with all apparent inequalities or discriminations.

Shaft Sinking and Cross Cutting

Elsewhere in this issue will be found an article on shaft sinking and crosscuting by R. S. Rainsford, which describes the routine of such work with commendable detail. In describing mining operations it is too often the case that the important small steps are omitted, but it is generally right in them that the greatest savings are made. Consequently an article that goes fully into them is especially worthy of attention.

While Mr. Rainsford modestly disclaims any great originality in the manner of performing his work, nevertheless there are several important features in it, and these are well worthy of remembrance and deserve emphasis.

In the first place experience showed that it did not pay to have the men work seven days a week. The men not only became stale and therefore failed in the long run to do as much work as they did when they rested one day out of seven, but when the men worked constantly, day in and day out, they firmly believed themselves entitled to a vacation at the end of the contract, and this vacation degenerated into a spree. The contractors at the end of such a debauch returned "broke," and it took some time for the crew to get into shape again for taking another contract. By making the men take a day off once a week, the spree at the end of the contract was generally avoided, and the company had a crew trained to a high point of efficiency and always ready to proceed on another contract. The advantage of a day's rest once a week is, of course, well recognized.

At the Argonaut mine, the very commendable practice was followed of making the shift that cleaned out the shaft find all "boot-legs" and plug these butts of holes with wooden stoppers so that there was no danger of drilling into a missed hole—a cause of many accidents in shaft sinking. Another commendable feature was the recognition of the relation between the diameter of the piston head in the machine drill, the air pressure, and the size of the hole drilled. This is an elemental principle in drilling, but how seldom is any thought given to this matter. The great advantage of machine sharpening of drill steel appears whenever it is attempted to drill holes with a minimum loss of gage in the bits.

The reader will notice that in the shaft-sinking the men were spurred on to efficiency by the offer of a bonus for the footage driven above a certain amount, while in the crosscutting speed was increased by doing the work on contract. It is only by these two methods that individuality can be awakened in the average miner, and it is to be hoped that mining companies will in time turn more and more to one or the other of these two methods of doing work, which will eventually restore efficiency to the miners who are now so obsessed by the Western Federation and its obtuse leaders.

The Zinc Ore Market

In a review of the situation in the zinc industry some months ago, we indicated that the conditions pointed toward an upward tendency in the market for spelter, barring the effect of a general recession in business, and an increase in the margin between the prices for spelter and ore. The probability of the latter condition was indicated by the approaching shortage of smelting capacity on the one hand, and the increasing supply of ore on the other hand.

The history of the last three months has borne out these forecasts. After a sharp rise in the price for spelter, we had a sharp decline, resulting from the slackness of business that affected almost all lines of industry. According to much evidence that condition is passing away, and we are now experiencing a general revival, in which the galvanizers, brass manufacturers and other consumers of zinc are participating. Consequently, we have been having a steady rise in spelter, resulting from heavy buying by consumers.

In the meantime the margin between spelter and ore has increased, of course, to the benefit of the smelters. Larger and larger supplies of ore have been coming in from the far West, while even in the face of relatively low prices the Joplin district has maintained its production. One result has been the accumulation of over 11,000 tons of zinc ore in the bins of the producers in the Joplin

district. This stock, which is unusually large, is held by a strong pool of producers, whose agreement runs until May 1. This reservation is not apparently causing any inconvenience to the smelters, whose margin has lately been increasing, so that some of them have expressed the belief that at last they may be going to have the innings for which they have patiently waited.

Scientific Management

Lately we have been hearing a good deal about "scientific management," especially since the evidence introduced recently by Mr. Brandeis in the railway cases before the Interstate Commerce Commission caught the public fancy, and now the subject has been taken up by the popular magazines. In this issue we reproduce, by the courtesy of *The World's Work*, a liberal portion of an article in its February issue, which is of interest to our readers because of its account of scientific management in a great metallurgical works. The story of its accomplishment there is impressive.

What is scientific management? Broadly speaking it is simply the expert study of details and the application of intelligent methods to save unnecessary labor, coupled with an incentive to the workman to interest himself. If it be found that in common practice the bricklayer makes eight motions in setting a brick and lays 120 brick per hour, whereas the same thing can be done equally well by three motions and the result be an increase to 350 in the number of brick laid per hour the economic benefit is self evident. Such has been actually effected.

Even in the lowest kind of manual labor, such as the moving of pig iron, it has been found possible to triple, and even quadruple, the accomplishment per man. These are not theoretical estimates. They are actual results.

The railway presidents affected to scout Mr. Brandeis' suggestion that they consider the application of scientific management to their work and recommended him to apply himself to improvement in legal procedure, but railway presidents, like trust presidents, are apt to be obtuse in broad economic questions. Scientific management is not an evolution from any professorial study, but comes from the works. Its prophet, Mr. Taylor, and his apostles are men who have done things in overalls. There is Frank B. Gilbreth, for example: What is a hard-headed contractor like him doing in such a galley if it be not worth while? Mr. Gilbreth, however, has applied scientific management in his own business with material benefit to himself, and in a recent book on the subject he proclaims that it has economic possibilities of such magnitude that all other forms of conservation appear to be relatively insignificant.

The application of this system in a metallurgical works has already been exemplified. What possibilities may it not have for mining practice? We commend it to the attention of our engineers and operators.

Uses of Gold

Referring to the question of the disposition of the gold production of the world, the London *Statist* has made a compilation of the approximate amounts of gold coin held by the large banks and State treasuries of Europe, America, India and Japan at the close of the years 1900 and 1910. According to its tables the total amount of gold coin and bullion so held was $2,501,335,000 in 1900, and $4,432,235,000 in 1910; the increase for the 10 years being $1,930,900,000. Now the production of gold for the 10 years ending with 1910 was approximately $3,809,975,000; so that a little over 50 per cent. of the total may be said to have passed into known circulation or reserves which form the basis of circulation. This is an interesting contribution to the discussion.

The Railroads and the Iron Markets

As we have noted from time to time, there have been comments and statements without number to the effect that the prevailing quiet in the iron market had its origin in Washington, and the future of the market depended upon the decision in the railroad rate cases. It is fair to say that these came chiefly from Wall Street and not from any accredited organ of the trade.

The position of the iron industry with respect to the railroads is that it depends upon orders growing out of the wearing out of the material, rather than on orders arising out of extensions. In 1887 there was nearly 13,000 miles of new railroad built, while in recent years there has been an annual average of about 5000 miles; but from 1887 to the present pig-iron production has grown from 6½ to 25 or 30 million tons, so that new railroad building absorbs but a small fraction of the present output. At the same time, the ton-mileage of freight handled by the railroads has quadrupled, which means that rails and rolling stock are being worn out about four times as fast.

Thus, any influence which tends to increase the freight movement tends to improve the prospects of iron and steel consumption by the railroads, and this view of the situation will probably prevail ultimately.

Prospecting for Potash

The U. S. Geological Survey has been instructed by Congress to prospect for deposits of potash salts in the United States, an appropriation of $20,000 having been made for this purpose. This will imply the inauguration of prospecting by drilling, if any real progress is to be made, and such we believe is the intention of the Director of the Survey.

Although this will be a new departure in the work of the Survey, there is absolutely no reason why it should not engage in such an enterprise of practical geology. In fact, the mining industry may properly look with approval upon any work inaugurated by the Survey to discover new mineral resources. This is one of the prime purposes of the Survey.

However, interesting questions will come up if the Survey should succeed in discovering a valuable deposit of potash upon the public lands. What then will be done with it? Will it be exploited by the Government as a national mine? Will it be given away to somebody for a pittance? Will it be sold to the highest bidder, or will it be rented under lease?

These are questions of policy that may soon have to be settled in a practical way. Government ownership of producing mines in this country is not without precedent, the lead mines of Missouri and Wisconsin having been operated under that condition for many years in the early part of the last century.

New Reef on the Rand

JOHANNESBURG CORRESPONDENCE

There seems every hope that the discovery of a reef 12 in. wide assaying 39.5 dwt. on the Cyferfontein farm near Klerksdorp will prove important. The older geologists placed the strata in which it has been found as lying below the Main Reef series. Doctor Voscule, the geologist whose name is associated with the discovery, came to the district without any preconceived notions and before the reef was cut came to the opinion that the Main Reef series, if they existed in the district, should be cut in the bore. It is stated that the strata underlying the zone in which the reef has been found can be traced in an outcrop for over 20 miles. The quartzites containing the reef are everywhere covered with overburden which has delayed discovery. A second reef has since been intersected in the borehole, but no announcement as to its metal content has been made public.

GEOLOGISTS WITH HOBBIES

Rand geology has unfortunately proved a happy hunting ground for geological cranks and stratigraphical maniacs. Two of these are quite well known and appear to believe that by constant reiteration and general abuse of competent geologists, they can turn the Main Reef series in any direction they please. If there is a geological fact established both by deduction and subsequent proof by actual mining work, it is that the mines on the far east Rand basin, the New Modderfontein, Van Ryn and others, are working on the Main Reef series. One genius persists in saying it exists in country through which dozens of shafts have been sunk to work the Main Reef without finding a trace of it and another persists in identifying it in one place just beyond Boksburg with the overlying Kimberley series and a little further on with the overlying Elsburg series.

One genius for many years preached that there were untold millions of wealth in reefs traversing Johannesburg and despite the fact that every street of the city has been deeply trenched for sewerage purposes without revealing a sign of the existence of such reefs or gold deposits, is still allowed by the newspapers to carry on his foolish propaganda which can do only harm and prevent money being subscribed to clear up the geological problems along the extensions of the reef where obscurity does exist.

Another so called scientist recently proclaimed his epoch-making discovery that the conglomerate beds of the Rand are really of igneous origin, but unfortunately he has not even the merit of originality for G. Henriksen, inspector of mines, Bergen, who bombards us with geological memoirs long ago proved this to his own satisfaction.

It seems to me that the chief trouble with all Rand geologists, orthodox or otherwise, is that they have "continuity" on the brain. Because certain well marked strata do persist in a wonderful manner for great distances they can never bring themselves to believe that it is only to be expected that quartzite beds may change along their strike to shale or slate or sandstone or *vice versa*, the beds well developed in one place may be represented only by a parting or small layer in another and, that in some cases it would be fair to correlate geological series in different districts even if one or two typical strata were quite absent. One so called orthodox geologist confidently fixed the position of the Main Reef 200 miles from the Rand on a single specimen of green-colored quartzite.

Another correspondent writing on this subject states that: At Randfontein it is not generally recognized that the Main Reef series has been found, in fact some go even so far as to doubt whether the reefs worked at the Lancaster and Randfontein mines belong to the Main Reef series, but at all events beyond Randfontein the Witwatersrand Upper Division which carries the Main Reef series disappears beneath the newer formation and so far as known does not appear again at the surface for a considerable distance south. About 60 miles southwest of Randfontein, the Lower division of the Witwatersrand formation comes to the surface and continues for over 30 miles, to beyond the old mining town of Klerksdorp. It is in this hitherto disregarded Lower Witwatersrand Division that the rich strike has been made.

PROSPECTING AT KLERKSDORP

A syndicate engaged in prospecting for the Main Reef series, which up to the present has never been discovered in the Klerksdorp district, had been working for some time without result, then the services of a consulting geologist were called in and after making a careful geological survey of the property the site of a borehole was determined where it was estimated the reef might be found if present, at a depth of 600 ft. When the drill reached a depth of 560 ft., a pebble reef 3 ft. wide was struck, the lower 12 in. of which assayed nearly 2 oz. of gold per ton. The upper 2 ft. were of unprofitable grade but 7 in. of the quartzite foot-wall assayed 5 dwt. to the ton. The question now arises as to whether this strike belongs to the Main Reef series for which the syndicate was prospecting or to one of the lower reefs known to occur in the western Rand, as the geological maps would seem to indicate.

The site of the borehole was fixed on grounds lending color to the suggestion that the Main Reef series ought to be struck at a depth of something like 600 ft. from the surface and the intersection of a rich reef if not belonging to the Main Reef horizon within about 50 ft. of the point calculated upon, must be regarded as a lucky coincidence. It is of some importance, of course, that the relation of the new strike to the Main Reef series should be established and the borehole is being continued deeper with that object in view. At present a depth of about 900 ft. has been attained, that is over 300 ft. below the strike, without encountering any of the usual Main Reef markers and failing these it is intended to continue the drilling down to the underlying shales.

Quincy Mining Company

The directors' report of the Quincy Mining Company for 1910, gives the mine output as 34,177,380 lb. of mineral yielding 22,517,014 lb. of refined copper for which $2,974,086, or 13.208c. per lb. was realized. After deducting for mining, opening mine, taxes, smelting and transportation the mining profits were $725,871. The actual business profits for 1910, after all deductions, were $642,693 and $550,000 was paid in dividends; the quick assets as of Jan. 1, 1911, were $1,062,907, as against $1,120,214 at the beginning of 1910. The actual cost of producing copper figures as 9.98c. per lb., or 10.35c. per lb. when all expenses are charged against the cost of production. During the year 800 acres of mineral land adjoining the Quincy holdings was purchased from the St. Mary's Canal Mineral Land Company, at a price of $600,000, of which $150,000 in cash was paid, the balance to be paid without interest in equal instalments during 1911 and the two following years.

General manager Charles L. Lawton states that operations were "very like those of the preceding year. The copper rock sent to the stamp mills was practically the same tonnage, as also the output or yield, of ingot copper. The development . . . was greater." He also states that the value of the copper rock continues about the same, but the percentage of mass copper has slightly increased to 21 per cent. of the total mineral produced. Additions have been made to the reserves and Mr. Lawton claims that there is within the boundaries of the company's properties, on the Pewabic lode, more than three times the copper-bearing ground that has been stoped during the 50 years of the company's active existence.

New equipment has been added at the mine, the Quincy & Torch Lake Railway system has been improved and a new reverberatory furnace about completed at the smeltery. These and other improvements have made it possible to produce copper at a lower cost despite increases in the cost of supplies and labor.

Correspondence and Discussion

Peculiar Mexican Laws Affecting Mine Officials

Gillmore Goodland, a mining engineer of London, with extensive experience in South Africa, Australia and other parts of the world, was imprisoned on Feb. 15 in a Mexican jail on the charge of libel, or what the Mexican law calls *injurias*, brought by an ex-bookkeeper of the Batopilas Mining Company, whom he had discharged. The Batopilas Mining Company, a New York corporation, capitalized at $9,000,000, in order to obtain working capital for its mining operations, formed in London in the year 1909, with the aid of Mr. Goodland's connections, an English company, called the Batopilas Mining, Smelting and Refining Company, capitalized at £300,000. In this new company the old company holds stock for £225,000, £50,000 worth of stock was sold at par in London and Paris and £25,000 worth remain in the treasury.

By contract the old company leased to the new company its principal producing mines and both its mills for the term of 25 years, with the intention later of forming sister companies, to develop other mines in its mineral grant after the first company had proved the desirability of the investment. At a meeting of the directors of the Batopilas Mining, Smelting and Refining Company on Oct. 14, 1910, it was resolved that Mr. Goodland should proceed to the mines as soon as possible and there arrange all matters involved in the transfer of the property to this company, and advise on the technical and financial operation of the company's property.

C. H. C. Moller, chairman of the board of directors, was requested to accompany Mr. Goodland on behalf of the French financial group interested in providing the present working capital, and was authorized to employ all such professional assistance as he might require in order to make a complete report to the French directors. Mr. Moller and Mr. Goodland were also appointed a committee of the directors to confer with the board of the Batopilas Mining Company to carry out the affairs named in the foregoing resolutions with full power to make all such arrangements as they considered fit in connection with the working of the property.

In New York the board of directors of the Batopilas Mining Company, of which Mr. Goodland is also a director, passed a resolution appointing him and Alexander R. Shepherd, Jr., the general manager in Batopilas, a committee to effect the transfer to procure the necessary adjustment of accounts. Mr. Shepherd was charged by the board to do everything possible to raise the technical efficiency of the work at the mines and was advised that the time had arrived for rigid economies and that expenditures in all departments should be reduced. Mr. Goodland was instructed to take up the subject most thoroughly.

Messrs. Goodland and Moller met with a great deal of opposition at Batopilas in the exercise of their commission, not only from the general manager, but from the company's employees. This opposition was made so strong and so personal, that their visit was made extremely unpleasant and their mission could hardly be carried out. Among other changes, the visiting directors insisted on a number of dismissals, and the accounts kept with and credits given to the departing employees were the principal reason which led Mr. Goodland to write a private letter of discharge which forms the basis of the suit.

It seems the question pending is: Has an employer or a superior officer the right to criticize the acts of an employee over whom he is placed? Can he express his opinion in regard to these in a private letter addressed to such employee? Does the translation into Spanish of this private letter contain any charges than can be used for action in court? Is the translation correct? Owing to technicalities of the Mexican Penal Code, requiring witnesses to testify from actual knowledge that the conduct of the accused has been good during the last five years, there has been difficulty in procuring release under bond, and added to this the absence of direct communication by mail with the capital of the State and the interruption of telegraphic communication by snowstorm and revolutionary actions, the matter could not be brought right away to the attention of the higher authorities.

From the point of view of the investor in Mexican mines the case is interesting. What right does an employer have under Mexican law to criticize an employee's actions? Does the foreigner lose the right of release under bond, simply because he can bring no witnesses who can swear that they know from actual personal acquaintanceship with the accused for five years that during all this time his conduct has been good? What consulting engineer can fill these requirements in the out of the way places in which he is likely to find himself?

It is to be supposed that close investigation will be made into the irregularities of which Mr. Goodland felt himself obliged to complain, and that the stockholders of the Batopilas Mining Company, as well as the European investors will take enough interest in the case to make a careful and prompt investigation.

The mines of Batopilas have given native silver ores of extraordinary richness for hundreds of years and during the last half century have been steady producers. The stockholders of the Batopilas Mining Company, however, have not of late years received much benefit from their investment. Why, will probably be explained in the reports made by Messrs. Goodland and Moller, which I hope will be published.

WALTER M. BRODIE.

Consulting Engineer of the Batopilas Mining Company.

Batopilas, Chihuahua, Mex., Feb. 20, 1911.

Views, Suggestions and Experiences of Readers

The Postage Question

The proposed increase of magazine postage failed to pass Congress, but in view of the declared policy of the Administration to push the matter further, the following letter is still of interest, especially as it puts the case of the technical papers in a correct manner:

Hon. F. P. Flint,
Senate Chamber,
Washington, D. C.

My Dear Mr. Flint:

I desire to enter my most emphatic protest against the effort to increase postage rates on periodicals and magazines. There are many reasons why such increase should not be made, which you are probably familiar with, but I wish to call your attention to one, which I think is the most important of all and sufficient to kill any legislation along the lines proposed.

An increase in postage rates would kill many trade journals. In this age of specializing every trade has its specific journal. Every progressive business man takes one or more of these trade journals. He has to, to keep up with his competitors.

These journals give technical information and are accurate in their data. The general newspapers cannot afford to run this class of information, as few of their readers are interested in these subjects.

Neither can one magazine cover all the great variety of trades. Each line demands a distinctive and exclusive journal of its own.

This reason alone should convince any reasonable man of the great injustice and injury which will be done thousands of our best business men and large mercantile and manufacturing concerns throughout the world if this change is made. No one can deny the immense value of such trade journals as the *Scientific American*, ENGINEERING AND MINING JOURNAL, etc. They not only stimulate the inventive genius, which revolutionizes the commercial activities, but they disseminate the information so that the great improvements when made become the property of the world at large.

Can such things be valued in mere dollars and cents? Is it wise to curtail such methods which tend to upbuild our great country?

I think not, and believe and trust you will use your best efforts to defeat any measure which so contemplates such a catastrophe on the commercial world.

Your sincerely,

GARNER CURRAN.

Los Angeles, Cal., Feb. 20, 1911.

Mining in Ketchikan, Alaska

My attention has been called to an omission in the *Press Bulletin* issued by the U. S. Geological Survey, Dec. 31, 1910, abstracted in the JOURNAL of Jan. 7, 1911, as a summary of mining in Alaska for the year 1910. In this publication no reference was made to the fact that in September operations had been renewed at the Rush & Brown copper mine, situated near Karta bay, Prince of Wales island. As the bulletin purported to enumerate all the properties in the Ketchikan district upon which any important work had been done during 1910, the operations at the Rush & Brown mine should have been referred to.

The only excuse that I can plead is that the press bulletin was prepared in considerable haste and that the omission was simply an oversight. There were probably other mining operations in Alaska of equal magnitude which did not receive mention, but in this case the omission was the less excusable because the fact of the renewal of operations at the Rush & Brown mine had been recorded in the JOURNAL of Oct. 22, 1910.

It is my purpose to have the annual summary of the mining developments in Alaska published by the U. S. Geological Survey present a complete account of the conditions of the mining industry throughout the Territory. I shall be glad if mine operators and engineers will inform me of any omissions or errors which occur in these publications. The *Press Bulletin*, issued about the first of January of each year, is simply a preliminary statement to be amplified and in some cases, I regret to state, corrected by the more complete report published some months later.

ALFRED H. BROOKS.

Washington, D. C., March 4, 1911.

Review of Cyanidation

In Philip Argall's article published under the above title in the JOURNAL of Jan. 7, 1911, he states: "The drum form of continuous filter, of which we may take the Oliver as a type, appears to be coming into use in the United States and Mexico; they all leave much to be desired, the complication of automatic valves on vacuum, pressure air and wash water prove troublesome, etc."

I do not intend to discuss here the relative merits and demerits of various types of filters, but wish to take exception to statements by an engineer of such high standing as Mr. Argall that are evidently based not on the operation of an Oliver filter, which has never had "valve troubles," but upon the difficulties experienced by an imitation of the Oliver filter which has lately been built in Denver, and which filter has necessarily had to omit the vital features incorporated in the Oliver. While I do not object to having the Oliver referred to as a type, I do most strenuously object to having the filter blamed for the deficiencies of inferior imitations.

In substantiation of the fact that the Oliver does not have "valve troubles," I beg to state that in the four years that I have been building these filters no changes have been made in mechanical principle or general design of the valve.

EDWIN LETTS OLIVER.

San Francisco, Cal., Feb. 25, 1911.

Zinc Ore at Joplin

Knowing that the JOURNAL does not wish to misrepresent matters affecting the zinc industry in the Joplin district, I beg leave to say that its recent remarks as to relative prices for zinc ore sold under the "contract system" and the open market are incorrect.

Ore selling under the contracts has uniformly brought from $1 to $3.50 per ton, net, more than the same grades of ore selling in the open market, and only a small tonnage of any grade of ore in the open market has exceeded the price that the same ore would have brought if sold on the scale which governs the contracts. The information that the contract price is better only on low-grade and undesirable lots is not true.

There is no fixed base price at any time. Every buyer is out for himself, and every bin is bid on separately, and as an individual transaction. The circumstances of the seller and the requirements of the buyer are controlling elements in each trade.

On March 1 a sale of 1000 tons of ore was made, this being the largest individual tonnage sold in many months. The ore was held by as strong a company as there is in the district, at a place convenient to railway track, in the heart of the district. It assayed 61 per cent. zinc, 1 per cent. iron, and less than 0.8 per cent. lead. Such a tonnage commands usually a premium of from 50c. to $1 per ton, which was true in this case. Yet the base price was $41. Under the scale, the ore would have brought $41.09 for cars carrying above 0.5 per cent. lead and $42.09 for any cars that sampled under that lead content.

That the contract price has been higher than the open market during the entire period for which the contracts have run is further emphasized by this instance, in that the open market is higher this week than at any time during the period of the contracts, and has more nearly equaled the contract base.

The JOURNAL also is misinformed with reference to the attitude of the district toward contracts. I am solicited daily by miners who desire to contract their output on this scale, and under terms similar to present contract.

B. K. BLAIR.

Secretary, Zinc Ore Producers' Association.

Joplin, Mo., March 3, 1911.

Americans Safe in Mexico

The present disturbances in Mexico have brought a new grief to the officials of the American mining companies operating in that country. Relatives and friends of the employees at the mines are naturally anxious for the facts and are besieging the American offices of the companies for information and assurance. Of course, this is natural and the solicitations cannot be ignored, but really there is a good deal of needless alarm and worry. Granting the facts of serious political unrest in Mexico, the situation does not present any cause for alarm for the personal safety of Americans engaged in their legitimate pursuits in the country. In fact the government and its opponents have so far avoided even giving inconvenience to the foreigners as far as conditions in the country will permit. I would ask that you publish this for the benefit of the anxious ones at home and also for the relief of the busy mining officials at this end.

PRESIDENT.

New York, March 1, 1911.

California Gold Production

In the JOURNAL of Feb. 18, 1911, appears a statistical table giving the gold production of California for a long period of years, but the figure for 1876 is omitted. Later on, it is estimated at $15,000,000. In Del Mar's "History of the Precious Metals," p. 400, this figure is given at $19,000,000.

ALGERNON DEL MAR.

Los Angeles, Cal., Feb. 28, 1911.

Details of Practical Mining

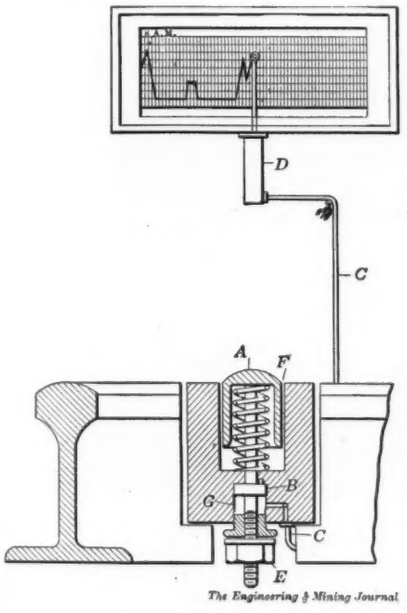
This department is designed to treat in a brief way of details of everyday practice. Many readers are doing interesting things in mining and milling that other readers like to know about. The thought that there is nothing new in them should not be a deterrent of telling about them. Something that is an old story in one district may be quite unknown in another. Our draftsmen can develop any kind of a pencil sketch that is intelligible. A blueprint answers all the purposes of the engraver. Contributions are solicited.

Notes of Interest to Prospectors and Operators of Small as well as Large Mines Things that have to be done in Everyday Mining

An Automatic Mine Car Tally

By A. Livingstone Oke*

It is impossible to maintain close personal supervision over trammers of waste and ore in a mine where there are a large number of working faces. In order to judge the amount of work done and attain a maximum of efficiency, it is desirable to have an automatic register for recording the number of cars or wheelbarrows of ore or waste taken from each working place.



Automatic Car Recorder Set in Rail

I suggest, in the accompanying sketch, a device that may be let into a rail, or set in the groove of a wheelbarrow track. It consists of a compression cap *A* within which is a strong spring *F*. The cap operates a small piston *B* in the compression cylinder *G*. This cylinder is connected by a tube *C* of small diameter to a second cylinder *D*. Within the second cylinder is a piston controlled by a rod and spring. The end of the rod carries a recording pencil that presses lightly on the roll of paper, moved by clock work.

The passage of a loaded car causes the pencil to trace a high double-peak curve, and the returning empty a lower one. By time ruling the roll of paper the time of passing of the cars can be registered quite accurately.

*Resident manager, Argentine & General Exploration Company, Rodeo, San Juan, Argentina.

Timbering Swelling Ground

By George C. McFarlane*

In swelling ground, in shales and schists it is noticeable that the swelling is always at right angles to the foliation, and drifts paralleling the stratification may require double setting, while the crosscuts will stand without timber. I have also noted cases where drifts in the upper workings had stood for years without retimbering, while below the oxidized zone heavy sets were crushed and broken in two months. As a rule this swelling ground is not difficult to retimber. Ground that is heavy because the rock is loose and full of slips often comes down in large masses; when a couple of sets break, the fall may bring down adjacent sets. On the other hand, in a drift in swelling ground the timbers may be crushing and binding and when a broken set is knocked out, only three or four wheelbarrow loads of rock will come down.

For replacing broken shaft sets in swelling ground I devised the form of timbering shown in Fig. 1. Two sets of 6x10-in. timbers with a 6x12-in. filler between the wall-plates are used. One side of the 6x10-in. piece and both sides of the filler are sawed on a bevel of one-half inch, as shown. In sawing, the bevel cut is made by placing a bar of flat iron across the bunks of the saw carriage in front of the head blocks and canting the stick back on the bar. In placing the sets, the posts must be put in tight, using two or more jacks to bring the plates and filler to a solid bearing at each post. In sinking a new shaft with this kind of timbering the set would be gripped together by hanger bolts until a set of dead logs were placed. As the walls of the shaft swell, the filler is of course forced in between the plates, causing the posts to sink into them.

If the plates and filler grip tighter on one side, the set will be crowded toward the slack side as it takes the squeeze. In an hour or so between shifts this can be remedied by jacking in a couple of extra posts on the slack side, and in this way the guides can be kept in good alinement. This form of set allows the walls of the shaft to swell four inches without breaking the timbers. Should the swelling force the filler flush with the plates, pieces of lagging can be removed, a few at a time, the wall cut back a few inches and the lagging reset by inserting blocks between it and the wall plates. The posts can then be removed and the filler jacked out with a couple of pipe jacks, the posts reset and the temporary blocking between the lagging and the wall plates removed. One set of posts will have to be chopped out to release the fillers of the first set; after that, many of the posts and part of the lagging can be recovered in shape to use again.

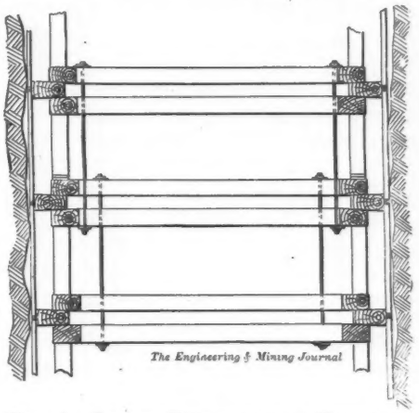


Fig. 1. Shaft Timbering in Swelling Ground

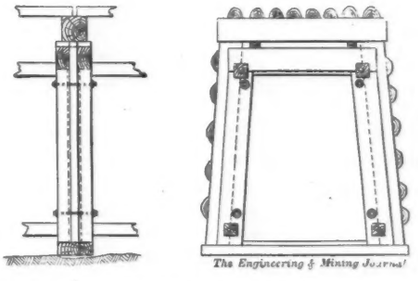


Fig. 2. Drift Sets for Swelling Ground

Fig. 2 illustrates the same principle applied to a drift or tunnel set. A couple of bolts would have to be used in each leg to clamp the filler; as the sets took

*503 Gas and Electric building, Denver, Colo.

weight the bolts could be removed, then the thrust of the collar and toe braces between the set would throw enough pressure on the filler to bind it. If the breast set were solidly braced with "rakers" it might not be necessary to use bolts at all. This style of timbering will stand fully as much squeezing before breaking as a double set and does not require as much excavation.

Analyses of Converter Fume

By Clarence C. Semple

The following analyses of converter fume were obtained a few years ago at the Aguascalientes smeltery of the American Smelting and Refining Company. At that time there were three stands of converters. The converters were of the deep type, 8 ft. in diameter and 7 ft. 4 in. high, from tuyeres to beginning of throat, or 16 ft. high over all. The lining was made of clay from Pachuca that contained a small amount of silver. This clay was mixed in grinding pans with various amounts of quartzose gold and silver ores, some of which were very high grade. The copper in the mattes varied between the wide limits of 28 and 55 per cent. but the aim was to make 45 per cent. matte in the blast furnaces whenever possible. The silver and gold content of the matte varied considerably; the average was probably about 6 kg. silver and 30 grams gold per metric ton of matte. The pressure of the blast ranged from 12 to 16 or 18 lb. per square inch.

The converter hoods extended at right angles from the flue. The flue was made of steel, oval in section, and provided with hoppers for drawing the dust. The oval pipe led to an exhaust fan which was placed in a brick house. There were four sections of brick chamber at the fan house through each of which the fume passed in succession. From the fan-house chambers the fume passed through a curtain chamber, thence through four lines of steel condensers provided with hopper bottoms. The condensers cooled the gases before they entered the baghouse, from which latter chamber a passage connected with the stack, 257 ft. high and 19 ft. in diameter.

The relative quantity of dust and fume collected from each of the various chambers is shown in the weights given in the table, but I am unable to state from what weight of matte converted or blister copper produced, this amount of dust and fume was obtained. The greater part of the fume recovered was grayish-white or pure-white impalpable powder, and the analyses show how great the losses may be when converting copper mattes containing much gold and silver, and especially when lead is present, unless there are adequate means of settling the dust and condensing the fume.

ANALYSES OF CONVERTER FUME.

	Weight in Kilograms.	Ag, Kilograms per Metric Ton.	Au, Kilograms per Metric Ton.	Pb, Per Cent.	Cu, Per Cent.	As, Per Cent.	SiO_2, Per Cent.	Fe, Per Cent.	Zn, Per Cent.	S, Per Cent.
At throat of converter	.....	4.328	0.0176	16.8	34.0	...	...	...	....	....
Converter flue dust	6,348	3.564	0.016	25.2	30.7	...	0.4	0.5	7.3	12.1
Oval pipe hopper	698	2.962	0.0112	30.0	24.9	...	0.6	tr.	8.0	11.1
Fan house, section 1	1,209	1.993	0.006	37.0	16.2	...	0.6	0.3	9.3	10.7
Fan house, section 2	2,358	2.690	0.011	29.5	20.7	...	0.7	0.3	8.8	11.4
Fan house, section 3	13,346	0.552	0.001	52.5	0.75	...	0.4	...	14.4	8.4
Fan house, section 4	5,585	0.435	tr.	57.0	0.50	...	0.4	tr.	11.5	8.3
Curtain chamber	12,871	0.495	tr.	54.8	0.90	...	0.5	tr.	11.1	8.7
Condenser	32,784	0.455	tr.	53.5	0.15	3.6	0.4	...	10.4	8.9
Baghouse 1	16,782	0.405	tr.	58.0	0.10	tr.	0.3	...	9.8	8.7
Baghouse header	1,198	0.505	tr.	58.5	0.10	tr.	0.2	...	9.4	8.8

Ignition of Sulphide Ores

In reply to an inquiry in the Journal of Jan. 28, regarding the ignition of sulphide ores from blasting, James B. Cook, of West Fairlee, Vt., writes:

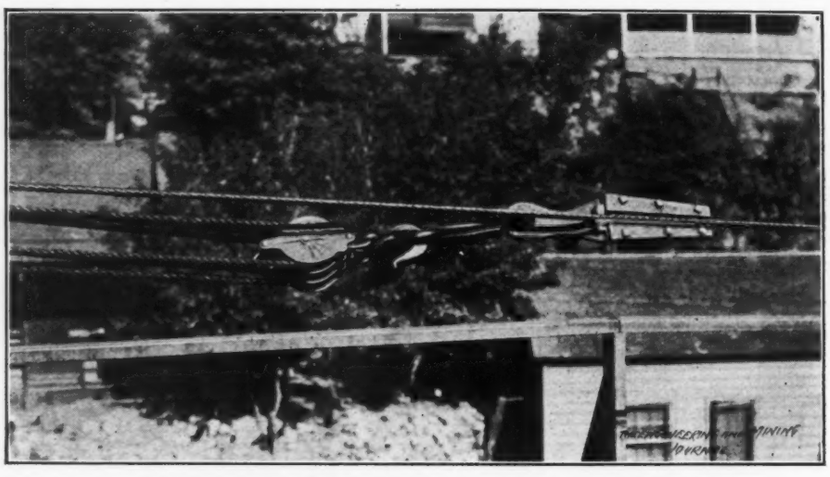
"I may state that I have known many instances of the ore being ignited and the mine filling with sulphur fumes. When this happens, it is usually caused by blasting dry holes. If water were forced into the hole before blasting, the possibility of the ore igniting would be reduced."

"The fumes from burning sulphur ore may be gotten rid of by connecting to a boiler, a 1-in. pipe running to the bottom of the drift where the fumes are most prominent. After blasting, steam is turned on for 15 to 20 minutes, after which time the mine will be free from fume. The best time for blasting and steaming is at noon."

Cable Clamp for Tramway

By Claude T. Rice

Tramway cables have to be frequently stretched, especially in the early period of the operation of a tramway. This is a rather vexatious task, owing to the design of the cable clamps in common use. The clamp furnished by the tramway companies is made of two iron plates, with a shallow central groove to increase the contact and consequently the friction of a cable when the clamp is tightened. At the end, the two plates are given an outward bend, so as to keep apart the ropes that are fastened to the plates of the clamp. Two different strands of the block and tackle system are attached to the twisted lengths in the ends of the two clamping plates, so there is little if any clamping effect obtained from the pull of the ropes. The entire pressure of the cable is obtained from the tightening of the six bolts that hold the plates together.



Stretching a Tramway Cable with a Ruttle Clamp

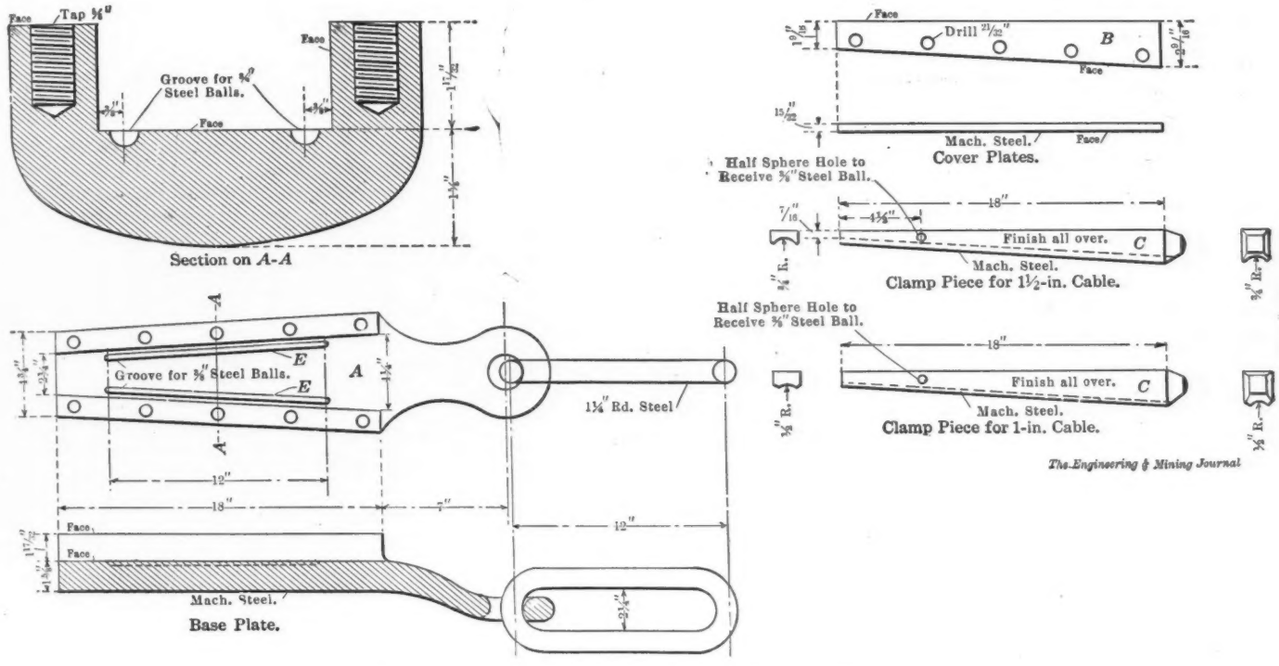
On the traction cable this design of clamp holds fairly well, as owing to its smaller size there is some compression and deformation of its shape; but upon heavier track cables, there is no compression with the forces obtainable by means of this device, and it does not work satisfactorily. Moreover, by use the cables wear into irregular shapes, becoming larger at one place than another. Should this clamp be placed upon one of the high places on the cable it is sure to slip. Another great drawback is the difficulty of putting the clamp on the cable, when, as is generally the case, it must be clamped on at a point away from the tower. It is no easy matter for one or two men to walk out on the track cable, holding to the traction cable with one hand and carrying the clamp in the other, and then put the

clamp on and securely tighten the bolts, while swinging in mid-air.

Joseph Ruttle, foreman of the Highland Boy tramway at Bingham, Utah, has devised the clamp that is now in general use at Bingham. This clamp is simple in design, effective in its operation, easy to put on the cable, even by one man, and can be cheaply made in any machine shop. This clamp is caused to grip by the pull of the tightening tackles and so is correct in principle. The tramway man has only to give the grip pieces a slight blow to cause an initial grip on the cable. In case the clamp should be put on at a point where the cable is larger than elsewhere, and there should be any slipping, the clamp adapts itself to the diminishing diameter of the cable and grasps the cable more securely than ever. An accompanying drawing shows the design of this clamp. It is an unpatented device and has been in use on the Bingham tramway for at least a year, but some of the tramway companies appear to be trying to assimilate the device and put it on the market as their own.

The Ruttle clamp consists of a base plate *A*, with raised sides, to which are bolted two cover plates *B* that partly cover the top of the base plate. The sides of the base plate taper toward the rear end, so, as the clamping pieces *C* move along the channels formed by the base plates, they are forced nearer together and so grip the cable more securely. The base plate has a curved neck, to which the blocks are attached by a ring. The clamping pieces have the face toward the cable turned to the diameter of the cable on which the clamp is to be used with that set of grips; but by having another set of grips the clamp can be quickly changed so as to be used on larger or smaller cables. The faces of the grips are segments of a cylinder, so they adapt themselves to the cable when it is considerably worn.

In order to hold the grip pieces in the channels in which they travel, a hemispherical pocket is bored in the grip piece to receive a ⅜-in. steel ball, while in the base plate a cylindrical groove is cut under each cover plate, in which the steel ball may travel. This groove is made long so the grip pieces may spread far enough apart at the head end to facilitate placing the clamp on the cable. When the grip piece is in its farthest position at the other end of the groove, its two faces are considerably nearer together than the diameter of the rope. The angle given to the back raised edge of the base plate determines the length of the groove, while the angle of the back edge and length of the base plate itself are determined by the length of gripping surface that is necessary to give a secure hold on the cable. The size of clamp shown in the detailed drawing is ample for all ordinary use. An accompanying illustration shows one of these clamps fastened to a traction cable ready to take up the stretch.



DETAILS OF THE RUTTLE CLAMP FOR TRAMWAY CABLES

Petroleum discoveries are reported by Consul John E. Rowen, within a few hours' ride of Puntas Arenas, in the region of Agua Fresca, in the Straits of Magellan.

Silica Sponge

A correspondent asks us why the pores of the "silica sponge," made by the Just process, do not become clogged. He asks if it be a fact that the pores are smaller than the finest slime of an ore, and has that been demonstrated scientifically, or is it merely an assumption?

We asked E. G. Spilsbury, 45 Broadway, New York, to reply to these inquiries, which he does as follows:

This is a question to which I have given much attention, it being somewhat of an enigma. In fact the pores are *not* smaller than the finest particles of the slimes treated. I can only explain the phenomenon by assuming that the ragged edges of the surface of the plates perform the same function in arresting the passage of the finest possible particles as has been found to be the case in zinc oxide manufacture, where wool, owing to the fine hairs lying on its surface arrests all solid materials before they reach the actual pores of the filtering medium.

In the case of the silica sponge the same condition apparently exists. The liquid, carrying the solids, striking the surface at a speed sufficient to move the solid material with it, is momentarily arrested by the fact that there is no direct passage for it, and it has to be deflected on all sides before it can find an exit. While this change in the direction of flow is taking place the solid particles lose their inertia and become attached to the points and rough edges of the filtering surface, and once

arrested are not easily entrained into the interstices by following currents.

That is about the only explanation I can give of the occurrence, but the fact is that in practice (now extending over more than a year) we have never had a case where the pores have become filled up beyond the most superficial film, which can be at once cleaned by the reversal of the liquid current.

Prevention of Dusting of Concrete Floors

By Albert Moyer*

Cement floors, particularly in warehouses, which do not have the advantage of obtaining the necessary moisture from the atmosphere such as outside floors and sidewalks on which the dew collects at night, if not properly protected and kept damp, became prematurely dry and are therefore more or less porous and weak, causing easy abrasion under foot traffic, or what is commonly known as dusting. Care should be exercised in keeping such floors damp by covering them with wet sand, wet hay or straw, for a week or more until the floor has properly hardened. If this has not been done and the floors are found to dust under foot traffic, the following remedy is suggested:

Wash the floor thoroughly with clean water, scrubbing with a stiff broom or scrubbing brush to remove all dirt and loose particles. Allow the surface to dry, and then as soon as dry apply a solution of one part water-glass (sodium silicate) of 40 deg. B., and three to four parts of water, the proportion of water depending upon the porosity of the concrete. The denser the concrete the weaker the solution required. Stir well, and apply this mixture with a brush (a large whitewash brush with long handle will be found the most economical). Do not mix a greater quantity than you can use in an hour.

If this solution is sufficiently thin, it will penetrate the pores of the concrete. Allow the concrete surface thus treated to dry. As soon as dry, wash off with clean water, using a mop. Again allow surface to dry and apply the solution as before. Wash off and as soon as the surface is again dry, apply the solution as before. If the third coat does not remain flush with the surface apply another coat as above.

The sodium silicate which remains on the surface, not having come in contact with the other alkalies in the concrete, is readily soluble in water and can therefore be easily washed off, thus evening up the color and texture of the floor. That which has penetrated into the pores, having come in contact with the other alkalies in the concrete, has formed into an insoluble, hard material, preventing dusting and adding materially to the wearing value of the floor.

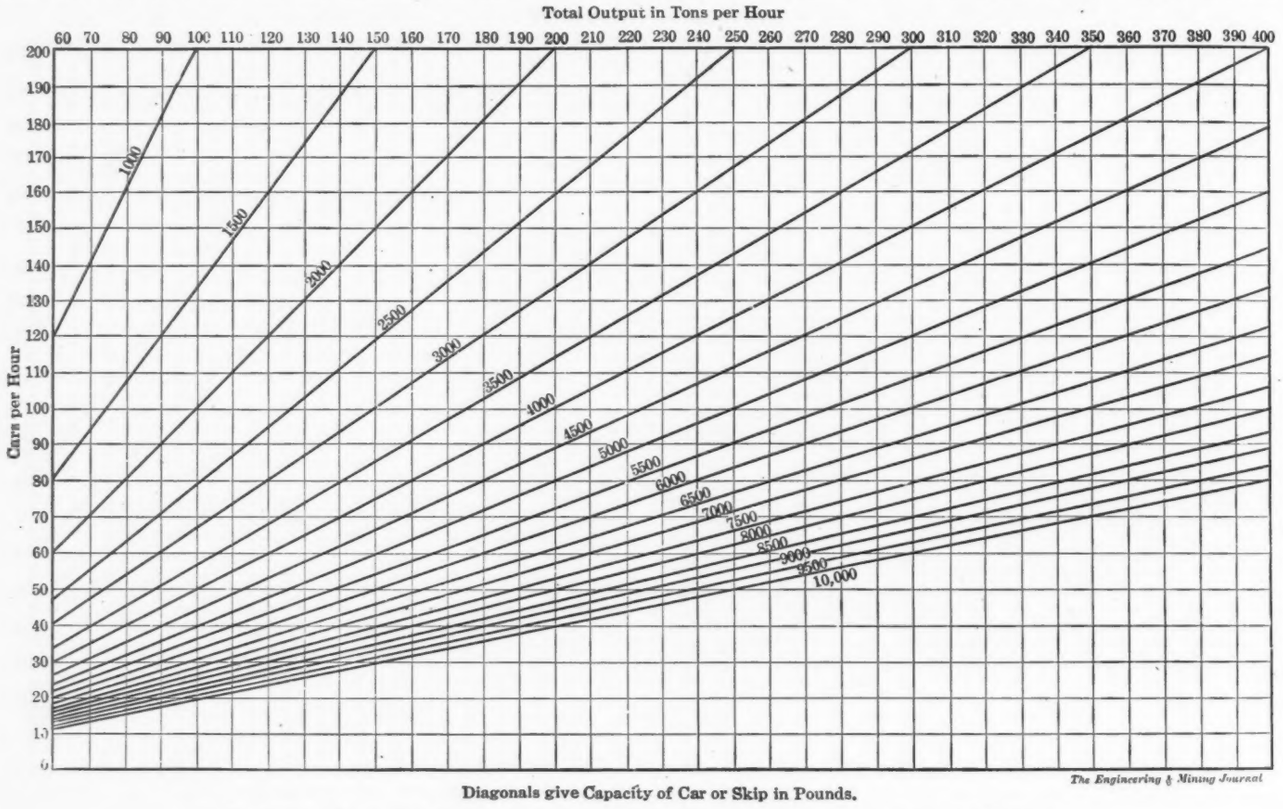
*Vulcanite Portland Cement Company, Fifth Avenue building, New York.

Determining Total Output in Tons per Hour

The accompanying chart, though simple, should be used in connection with the other diagrams published in recent issues of the Journal. With these charts any hoisting problem can be worked out without any figuring whatever.

For instance, assuming that a mine manager has put down a test hole and finds that the coal lies, say, 400 ft. below the surface. He figures that he wants to get out, say, 2400 tons in eight hours; this would be equivalent to 300 tons per hour. By referring to the chart he will see that with a car holding 5000 lb. of coal, it would be necessary for him to get out 120 cars per hour. By referring to the chart, then, for any output, he could promptly determine the amount of coal it would be necessary for him to handle in each car. By using this diagram in connection with the charts giving rope speeds for various numbers of cars per hour from shafts of various depths, he will be able to ascertain whether this rope speed is too high for practical work.

[Note—This article is the seventh instalment, and concludes the series of charts on hoisting, prepared by L. F. Mitten, of the Vulcan Iron Works, Wilkes-Barre, Penn.—Editor.].



Diagonals give Capacity of Car or Skip in Pounds.

A Simple Diagram That Enables the Quick Determination of Total Output

A chromium-bronze shaft and worm weighing 1200 lb. was recently cast by the Naulty company, of Philadelphia.

Report of Yukon Gold Company

Excellent progress was made last year at the properties of the Yukon Gold Company, situated in the Klondike district of Alaska, principally on Bonanza, Eldorado, Bear and Hunker creeks. The financial statement as of Dec. 31, 1910, is presented herewith, and the report of O. B. Perry, consulting engineer and general manager for the company, giving a detailed résumé of dredge and hydraulic operations, for the year ended Dec. 31, 1910, is given below practically in its entirety:

The dredging season in 1910 was longer than usual. Six dredges handled 3,249,788 cu. yd. of gravel containing 66c. gold at 31c. cost per cu. yd. Hydraulic operations practically doubled; the cost per cu. yd. was 25.7 cents.

New Property and Equipment

"The property holdings of the company in the Yukon territory have been added to by the acquisition, both by outright purchase and by working agreement, of a number of creek claims within the territory embraced by the company's operations, as well as some bench and hillside claims suitable for hydraulicking. The properties acquired during 1910 show an estimated total of 1,300,000 cu.yd., of which approximately 1,000,000 cu.yd. are creek gravels suitable for dredging, the remainder being hydraulic ground.

"The increase of the equipment consisted of distributing pipe lines, tunnels and sluices for the opening of the hydraulic mines. The principal additions of this nature were on American hill, where 1200 ft. of 26- to 22-in. pipe was installed with sluices and monitors ready for operation; American gulch, Boulder creek, Gold hill and Lovett, where pipe lines were laid and mines opened for operation; on Cheeckaco hill a tunnel was driven 300 ft. in length with Y-branches and raises, 450 ft. of 52-in. sluice, 1000 ft. of distributing pipe lines with gates, branches and six hydraulic giants.

"The No. 5 dredge, which had encountered severe physical difficulties in operating at the mouth of Hunker, was removed and rebuilt on 30 Below on Bonanza."

Dredging Operations

The opening of the season was earlier than in 1909 although the first warm weather was followed by cold which somewhat retarded the dredge operations. The last of the six dredges which were then in commission, began operations May 24, as against June 9 last year. The dredging season for six out of the seven dredges was 159, as compared with 132½ days in 1909, or an increase of 20 per cent. The running time of one dredge, No. 5, was curtailed due to moving and rebuilding. The total operating time for this dredge was 108 days."

"The dredges, during the season, handled 3,249,788, as compared with 2,381,880 cu.yd. last season, an increase of 36 per cent., and produced $2,150,723 gross gold, as compared with $1,363,722 last season, or an increase of 57 per cent. The value per cubic yard was 66.18c., as compared with 57.24c. last season, or an increase of 15 per cent.

Cost of Dredging

"The cost in 1910 was 31.09c. while in 1909 it was 31.94c. per cu.yd. The cost includes all thawing charges, amounting to 14.60c. per cu.yd., preliminary stripping operations, gross gold tax, selling charges and depreciation. The increase of 20 per cent. in the length of the operating season is accounted for by the fact that for the first time since operations were begun, power was available for late autumn operations. The No. 5 dredge was able to run until Nov. 10, and was then closed down on account of lack of water for flotation. The hydroelectric plant was shut down Oct. 6, and from that time no power was purchased from the Northern Light and Power Company's steam-driven plant.

"With regard to the costs, it may be mentioned that the mid-season cost showed a marked improvement over the previous season, but the October and November operations being considerably more expensive, brought the cost up to the figure given above, which is slightly under that for the season 1909. While the early spring and late autumn operations add to the length of the dredging season, work during these periods is unavoidably more expensive than during the open or mid-summer season.

YUKON GOLD COMPANY STATEMENT, DEC. 31, 1910.

Assets.

Property and investments (including organization expense, surveys, etc.)	$11,885,460
Equipment (cost of ditches, dredges, pipe lines, etc.)	6,427,002
Deferred charges (operating expenses, stripping and temporary equipment applicable to future work)	537,865
Supplies and materials	548,783
Accounts collectible (including advances to subsidiary companies)	344,636
Cash	32,182
	$19,775,928

Liabilities.

Capital stock	$17,500,000
Guggenheim Exploration Company	499,850
Bills and accounts payable	1,104,828
Depreciation	288,799
Surplus after payment of dividend Dec. 31	382,451
	$19,775,928

Hydraulic Operations

"During the season, a total of 1,406,397 cu.yd. were handled in the hydraulic mines, including mechanical elevators, as compared with 705,544 cu.yd. handled in 1909, or an increase of 99 per cent. The total gross production was $696,375 as compared with $383,877 in 1909, or an increase of 81 per cent.

"The cost this season was 25.69c. per cu.yd., as compared to a cost for 1909 of 41.78c., or a decrease of 63 per cent. The total charges against the main ditch for the season of 1910 were $196,000 approximately, including operation, maintenance, repairs and construction. Of this $19,645 was charged to power-plant operation, and $56,645 to hydraulic operations, the remainder was taken up in deferred and construction charges and does not appear in the above statement of cost.

"In the above comparison of costs, royalties paid under working agreements are not included, and this comment applies as well to the statement as to dredging cost. The royalties take the form of a percentage of both the gross and net return, and are subject to wide variation so that they cannot be included in statements of operating cost. The royalties paid in 1909 were heavy, amounting to over $120,000. This amount will be materially reduced in 1911, as the work will be confined almost entirely to properties owned by the company.

Ditches and Pipe Lines

"The main ditch system from the Twelvemile river was operated 118.3 days out of a possible 150 days, or 78.7 per cent. of the possible time. The average daily delivery of the Klondyke pipe-line discharge penstock was 3038 24-hour miner's inches as against a theoretical capacity of 5000 miners inches, or 60.9 per cent. of the possible flow. The largest 24-hour average flow was 4780 miner's inches.

"During the operating season there were several breaks in the ditch at points where glaciers had been met with in the construction. These breaks reduced the running time, thus decreasing the production and increasing the cost. The breaks occurred largely at points which had given little trouble during the first year's operation in 1909, but the trouble was, to a certain extent, anticipated, due to the icy condition known to exist at these places.

"The principal delays and difficulties were at Quigley, Kentucky Point, Noble Creek and Cripple Creek sections, which

accounted for 83 per cent. of the total time lost. Temporary repairs were made at these points and when the operating season was over, new construction, consisting of piles and flume, was installed. Experience for the last two seasons has shown that this construction will carry the flow successfully when practically no other form of underpinning will stand on account of the presence of ice seams in the earth mass. With this construction completed, there is no reason to anticipate repetition of the breaks and delays incident to past season's operations. The pipe lines which caused some difficulty and considerable delay in the season of 1909, caused practically no interruption of service in 1910. From the tests that have been made, they promise to deliver fully up to the capacity for which they were designed.

Conclusions

"From the above, it appears that the company's dredging operation has shown a marked improvement over the past season, and that the hydraulic work has also improved, although not as rapidly. The increase in recovery over the previous season indicates not only an improvement in the tenor of the gravels, but also an improvement in the method of working.

"In view of the success met with by the dredges in handling the creek gravels, the decision was reached this season to work a number of claims on Bonanza which it had been the previous intention to abandon for tailings room. This work has now been begun, and while the result will be to hold back the hydraulic work from reaching its maximum output, the net result will be a substantial gain."

Mineral Production of Canada

By John McLeish*

A production rapidly gaining in value and variety. Canada furnishes most of the nickel supply of the world; and produces nearly all of the useful metals and minerals.

*Chief of the division of mineral resources and statistics, Canada Department of Mines.

Although complete statistics are not yet available, sufficient information is at hand to indicate that the total value of the mineral production of Canada during 1910 exceeded $105,000,000. This production is made up from such a great variety of well established mining industries that the record should be particularly gratifying not only to those who are directly interested in the development of the mineral resources of the country, but also to the public at large who indirectly profit thereby. Not only is the increase over the production of the previous year a large one, having amounted to $13,209,517, or over 14 per cent., but an examination of the details of production shows that the increase has been fairly well distributed among the more important ores and minerals produced in Canada.

MINERAL PRODUCTION OF CANADA IN 1910.

Product.	Quantity.	Value.
Metallic.		
Copper.....lb.	56,598,074	$7,209,463
Gold.....	.....	10,224,910
Pig iron from Canadian ore.....tons	104,906	1,651,321
Iron ore (exports) "	114,449	324,186
Lead.....lb.	32,987,508	1,237,032
Nickel..... "	37,271,033	11,181,310
Silver.....oz.	31,983,328	17,106,604
Zinc ore and other products.....	.....	235,000
Total metallic.....	.....	$49,169,826
Non-Metallic.		
Arsenic, white...tons	1,502	$ 75,328
Asbestos..... "	75,678	2,458,929
Asbestic..... "	24,707	17,629
Coal..... "	12,796,512	29,811,750
Corundum..... "	1,870	198,680
Feldspar..... "	15,719	47,867
Fluorspar..... "	2	15
Graphite..... "	1,243	59,087
Grindstones..... "	3,847	43,936
Gypsum..... "	513,313	939,838
Magnesite (shipments)..... "	328	2,493
Mica..... "	.....	143,409
Ochers..... "	4,813	33,185
Mineral water.....	.....	175,173
Natural gas.....	.....	1,312,614
Peat..... "	771	1,735
Petroleum.....bbl.	315,895	388,550
Phosphate.....tons	1,319	11,780
Pyrites..... "	55,925	192,263
Quartz..... "	88,205	91,951
Salt..... "	84,092	409,624
Talc..... "	7,112	22,308
Tripolite..... "	22	134
Total non-metallic.	.....	$36,438,278
Structural and Clay Products.		
Cement, Portland bbl.	4,753,975	$6,414,315
Clay products—		
Brick.....	.....	5,930,630
Sewer pipe, fireclay, etc.....	.....	1,669,370
Lime.....bu.	5,721,285	1,131,407
Sand and gravel (exports).....tons	624,824	407,974
Sand lime brick.....	.....	360,894
Slate.....	.....	18,492
Stone—		
Granite.....	.....	634,783
Limestone.....	.....	2,303,804
Marble.....	.....	158,779
Sandstone.....	.....	402,406
Total structural & clay products	.....	$19,432,854
Total value, 1910	.....	$105,040,958

The subdivision of the mineral production in 1909 and 1910 by provinces was approximately as shown in the accompanying table.

Province.	1909.	1910
Nova Scotia.....	$12,504,810	$14,054,534
New Brunswick.....	657,035	585,891
Quebec.....	7,086,265	8,193,275
Ontario.....	37,374,577	43,017,026
Manitoba.....	1,193,377	1,470,776
Saskatchewan.....	456,246	557,806
Alberta.....	6,047,447	7,876,458
British Columbia.....	22,479,006	24,547,817
Yukon.....	4,032,678	4,737,375
Total.....	$91,831,441	$105,040,958

It will be observed that there has been an increased production in nearly every province, the only falling off being shown by New Brunswick, in which the gypsum production and some of the structural products showed a slight decrease.

The returns of smeltery production are not yet complete. The total ores sent to furnace, in 1910 were: Nickel-copper, 628,947; silver-cobalt-nickel-arsenic, 9466; lead and other ores treated in lead furnaces, 57,547; copper-gold-silver, estimated, 2,000,000; total, 2,695,960 tons, an increase over 1909 of 321,345 tons.

Gold

The Yukon gold production is valued at $4,550,000, the total exports on which royalty was paid being 275,473 oz.; the increase over 1909 being $590,000. The British Columbia production is given by the Provincial mineralogist at $5,432,000, an increase of $257,822 over 1909. Nova Scotia production decreased about $20,000, while Ontario showed some increase, chiefly due to gold recovered in development work in the Porcupine district.

MINERAL PRODUCTION IN CANADA, 25 YEARS.

Year.		Year.	
1886	$10,221,255	1899	$49,234,005
1887	10,321,331	1900	64,420,877
1888	12,518,894	1901	65,797,911
1889	14,013,113	1902	63,231,836
1890	16,763,353	1903	61,740,513
1891	18,976,616	1904	60,082,771
1892	16,623,415	1905	60,078,999
1893	20,035,082	1906	79,286,697
1894	19,931,158	1907	86,865,202
1895	20,505,917	1908	85,557,101
1896	22,474,256	1909	91,831,441
1897	28,485,023	1910	105,040,958
1898	38,412,431		

Silver

The total production of silver in 1910 including that produced as bullion and the metal estimated as recovered from ores sent to smelters or otherwise treated was approximately 31,983,328 oz., as compared with 27,529,473 oz. in 1909. The increase is chiefly credited to Cobalt and adjacent mining districts of Ontario. There was a slight falling off in the silver production of British Columbia as a result of the decreased production from the silver lead ores of the Province. For the province of Ontario, complete returns have been received from all the larger operators, while estimates based on railway shipments have been made for two or three of the smaller mines. The total shipments of ore and concentrates were about 34,580 tons, containing approximately 29,931,678 oz. of silver, in addition to which somewhat over 940,000

oz. were shipped as bullion. The average silver content of ore and concentrates shipped was thus 865.57 oz., or $462.96 per ton, as compared with 840 oz. in 1909.

Copper

No refined copper is produced in Canada, but the copper ores are mostly reduced to a matte or blister copper carrying some gold and silver. In Quebec where the copper is recovered subsequently to the extraction of the sulphur from pyritic ores, there was increased activity during the year. A small quantity of ore was exported from British Columbia coast mines and the Yukon to United States smelters for treatment. In Ontario, where the copper is chiefly recovered from the nickel-copper ores of the Sudbury district, there is a very large increase in production.

Statistics are not available at the present time to show the total quantity of copper contained in ores shipped from the mines. The total production of copper, however, contained in blister and matte produced and estimated as recoverable from ores exported was in 1910 approximately 56,598,074 lb. Of the production in 1910, Quebec is credited with 957,178 lb.; Ontario, 19,259,016 lb.; and in British Columbia the production is estimated at about 36,000,000 lb. Ontario shows an increased production of 3,512,317 lb. or 22.3 per cent., while British Columbia shows a slight increase.

Nickel

There was a large increase in the production of nickel-copper ores in Ontario during the past two years, and it is perhaps not generally realized that the production of nickel in this province is now almost as large, pound for pound, as the production of copper in British Columbia, while the market price of the metal is from two to three times that of copper. A portion of the production is, however, now recovered with copper as monel metal and sold at a much lower price than fine nickel. Active operations are being carried on by the same companies as formerly, the Mond Nickel Company, at Victoria Mines, and the Canadian Copper Company, at Copper Cliff.

The aggregate results of the operations on the Sudbury District nickel-copper ores during the past two years were as follows in tons of 2000 pounds.

	1909.	1910.
Ore mined	451,892	652,392
Ore smelted	462,336	628,947
Bessemer matte produced	25,845	35,033
Bessemer matte shipped	.....	.....
Copper contents of matte shipped	7,873	9,630
Nickel contents of matte shipped	13,141	18,625

Exports of nickel contained in ore, matte, etc., as compiled from Customs reports in 1910 were: To the United States, 30,679,451; to Great Britain, 5,335,331; total, 36,014,782 lb., an increase of 10,398,384 lb. over the previous year.

Iron

Excluding Quebec, for which complete returns have not been received, the production of iron ore in 1910 was 254,915 short tons, valued at $566,109. The shipments may be classified as magnetite, 124,535 tons, hematite, 130,380 tons. Exports of iron ore from Canada during 1910 are recorded by the Customs Department as 114,499 tons. This is chiefly from Moose Mountain mine, Ontario, Torbrook, N. S., and Bathurst, N. B. Although not a Canadian production, it may be of interest to state that the two Canadian companies operating the Wabana mines, shipped during the year 1,259,626 short tons, of which 808,762 tons were shipped to Sydney, Cape Breton, and 450,864 tons to the United States and Europe.

The production of pig iron by provinces for two years was:

	1909.	1910.	Changes.
Nova Scotia	345,380	350,287	I. 4,907
Quebec	4,770	3,237	D. 1,533
Ontario	407,012	447,296	I. 40,284
Total	757,162	800,820	I. 43,658

These figures do not include the output from the furnaces making ferro-products, at Buckingham, Que., Welland and Sault Ste. Marie, Ont. The exports of pig iron during the year are reported as 9763 tons. Probably the greater part of this is ferro-silicon and ferro-phosphorus, produced at Welland and Buckingham. There were imported during the year 227,753 tons of pig iron, 16,106 tons of charcoal pig and 18,900 tons of ferro-manganese.

Production of steel in 1910 was: Open-hearth, basic, 599,015; converter, acid, 223,266; total, 822,281, of which 803,600 tons were ingots and 18,681 tons direct castings. Total bounties paid on iron and steel were $1,344,145.

Coal and Coke

The total coal production in Canada in 1910, comprising sales and shipments, colliery consumption and coal used in making coke, is estimated at 12,796,512 short tons; an increase of 2,295,037 tons, or nearly 22 per cent. over 1909, and is the largest production of coal yet recorded for Canada. The production by provinces was as follows:

Province.	1908.	1909.	1910.
Nova Scotia	6,652,539	5,652,089	6,407,091
British Columbia	2,333,708	2,606,127	3,319,368
Alberta	1,685,661	1,994,741	2,824,929
Saskatchewan	150,556	192,125	190,484
New Brunswick	60,000	49,029	53,455
Yukon Territory	3,847	7,364	1,185
Totals	10,886,311	10,501,475	12,796,512

The exports of coal are reported by the customs department as 2,377,049 tons. Imports of coal during the year include bituminous, 5,966,466 tons; slack, 1,356,281 tons, and anthracite, 3,266,235 tons; a total of 10,597,982 tons.

The total production of oven coke in 1910 was about 897,273 short tons, as compared with 862,011 tons in 1909. The total quantity of coal charged to ovens was 1,373,793 short tons. By provinces the production was: Nova Scotia, 507,996 tons; Ontario, 25,959; Alberta, 121,578; British Columbia, 241,740 tons. The coke is all made from Canadian coal with the exception of that made by the Atikokan Iron Company, at Port Arthur. All of the coke produced was used in Canada with the exception of 50,922 tons sold for export to the United States, chiefly from Alberta. The quantity of coke imported during the year was 737,088 tons.

The quantity of corundum ore treated during the year was 37,183 tons, from which was produced 1686 tons of grain corundum. The shipments were 106 tons sold in Canada and 1774 tons sold in other countries, a total of 1870 tons.

Canadian Mining Institute

The annual meeting of the Canadian Mining Institute was held at the Chateau Frontenac, Quebec, March 1-3, about 80 members being present. Dr. F. D. Adams, the president of the Institute, presided at its several sessions, all of which were held in the hotel. A large number of interesting technical papers were read, these covering the subjects of asbestos, graphite, copper, coal, gold and slate mining. A good many engineers from the United States attended the meeting. The social side of the meeting was not neglected. On Thursday evening there was a highly enjoyable smoker, and on Friday evening a formal dinner. The management of the meeting was excellent.

Power Plant for Porcupine

Toronto Correspondence

Rapid progress is being made with the construction of the electric power plant at Sandy Falls on the Mattagami river, 11 miles to the northwest of the Porcupine gold area, in order that power may be supplied to the mines as soon as possible. A large quantity of machinery is on the ground and being set up. The dam to supply the power for the electric generators is more than half completed. When finished it will be 730 ft. long, and will produce a 25-ft. fall of water. One sluice has already been built so that 2000 h.p. can be developed upon the opening of the plant. Preparations are being made for the stretching of 70 miles of transmission lines. The wires used will be of aluminum. It is expected that power can be transmitted by June 1. The Hollinger has contracted for 1000 horsepower.

Sinking and Driving at Argonaut

By R. S. Rainsford*

By attending to details, omitting Sunday work, and using either a contract or a bonus system, the speed and cost of shaft sinking and crosscutting have been greatly bettered.

*General manager, Argonaut Mining Company, Jackson, Cal.

It is always the other man's job that is easy, the other manager's mine that ought to be cheap to work. To this I heartily subscribe, and having seen several articles on fast driving and sinking under what I prefer to believe were unusually favorable conditions, I am minded to bring encouragement to hard-worked foremen and superintendents, whose workings refuse to advance at the speed of a Los Angeles aqueduct or a Simplon tunnel, by giving some results obtained in the Argonaut mine. For by so doing I hope to do something, however insignificant, to lower the standard of perfection so frequently held before our dazzled eyes by the mining press.

The results given below are for the last year, but the system they represent has now been in force at this mine for two years, the figures for 1909 being almost identical with the figures for 1910. Nothing startling, however, is claimed for these performances, nor do the methods employed present anything novel. Their only merit is that they achieved to a reasonable extent their object, namely to attain a combination of fair speed and low cost per foot. Yet for this individual mine they represent an increase in speed of 100 per cent. over what had previously been considered possible, and a decrease of 25 to 50 per cent. in the cost per foot. Needless to say better appliances were used than formerly, and an improved and systemized method of procedure was enforced. Yet the same classes of labor were employed as formerly, many of them the same men, but in the beginning they were more closely watched and advised, and stimulated to their best endeavor by contract and bonus.

The details of the work are given with some apology for their fullness, but with the belief that details alone make any work understandable, and with the hope that others may give the benefit of their experience and suggestions.

The Argonaut Shaft

The Argonaut shaft is an incline with a slope of approximately 60 deg., roughly parallel with the dip of the vein and, in the bottom levels, distant about 300 ft. from the hanging-wall. The depth of the shaft is now 3130 ft., measured vertically,, or 3675 ft. on the incline, and the level interval in depth 150 ft. on the incline.

The country rock in the hanging-wall of the vein is composed of a laminated series of sedimentaries, dipping usually with the vein but at a somewhat steeper angle, and composed of schists and slates of varying composition and hardness. The schists are usually hard and break in large pieces,while the slates are soft and break very fine, but both give endless trouble in deep workings from caves and swelling ground in all openings except crosscuts driven directly across the formation. Hence drifts in ore have led to the introduction of a system of timbering in the Argonaut and Kennedy mines that is, I believe, unique. On the other hand the Argonaut shaft requires 20x20-in. timbers for wall plates, and a crew of six men is always employed in the shaft to ease timbers, replace those badly broken, and keep the track of 40-lb. tee-rail in safe condition for the passage of the 3-ton skips.

The shaft has three compartments, 4 ft. 1 in. by 5 ft. 9 in. in the clear, timbered with 20x20-in. wall plates 16 ft. long, 14x20-in. end plates 6 ft. long and 10x20-in. dividers 6 ft. long, both end plates and dividers being mortised into the wall plates the better to withstand end pressure. The shaft sets are placed at 5-ft. centers, with four corner blocks, or posts, 10x16-in. section and 3 ft. 6 in. long between sets, so that a shaft set, disregarding blocking and lagging, contains 1733.25 ft. b.m. The wall plates come 4 in. over size so that the outside dimensions of a set are 16 ft. 4 in. by 9 ft. 1 in., giving an area for the shaft of about 150 sq.ft. But in sinking the shaft the area excavated must be considerably increased above that size in order to provide room for blocking, and the bridging and lagging required by the heavy nature of the ground. Consequently, in sinking the Argonaut shaft the cross-section broken is 50 per cent. larger than that of the next largest shaft in the district.

Crew Employed in Shaft Sinking

The sinking crew is composed of three shifts of five men each, being two machine men at $3 per day, two chuck tenders at $2.75, and an engineer at $3 who runs the air-operated sinking hoist installed on the bottom bevel. The shaft is taxed to the limit of its capacity under its present equipment, and it is therefore necessary to provide in the foot-wall of the station a special pocket for shaft waste, into which the sinking skip dumps, and from which it is trammed to the main waste bin in the hanging of the shaft.

To break the bottom for an advance of five or six feet requires 32 holes of a vertical depth of 6 ft. These are drilled by two machines mounted on crossbars 2 ft. inside the end plates. Each machine drills four rows of four holes each. The first row is drilled flat for a cut, and so as to meet the corresponding holes of the other machine, the second row is less inclined, the third row vertical and the last row steeply inclined in the opposite direction. Consequently, the cut holes must be drilled to a depth of 9 ft. to reach the same vertical depth as the vertical holes 6 ft. deep of the third row. All holes are drilled from the same side of the bar, beginning underneath for the cut.

Two to 2½ shifts are required to drill the round, exclusive of any pop holes, using two 2¾-in. Sergeant drills, with an air pressure of from 80 to 90 lb. Larger drills and higher air pressure would have been preferred, but the compressor capacity is limited, and to have used larger drills would, it was estimated, further reduce the air pressure and thereby not only reduce the efficiency of all piston drills but particularly affect the Waugh drills in the stopes, which need at least 80 lb. for high efficiency.

Size of Bit Used on Drills

To make up, therefore, for the small piston diameter of the shaft drills the diameter of the bits are reduced as much as possible. The bit on the finishing drills for the cut holes, which are 10 ft. long, is 1¼ in. in diameter on a shank of 1-in. octagon steel. But the bits on the starters have a diameter of only 2½ in., and both they and all drills up to 8 ft. in length are made with 1⅛-in. shank steel as these are the lengths most easily bent. Bits in all cases are made by welding cruciform steel, of size suitable for the size of bit, on octagon steel for shanks, and are sharpened by an Eclipse drill sharpener which procedure, because of the accurate sizing of bits, obviates the trouble usually experienced when using drills with a two-foot change and close gage. Thus, with these small starting bits fairly rapid drilling is accomplished, and the 2¾-in Sergeants, with their 6½-in. stroke, prove their power by bending any shanks not made of the stiffest and best grade of high-carbon steel.

The powder used is 40 per cent. gelatin, with a few sticks of 60 per cent. at the bottom of the hole. The cut is blasted first, then cleaned out, and the bottom blasted again with the rest of the round.

Finally, after blasting the second time, any bottoms left are again blasted. This arrangement is far from satisfactory, since it consumes much time, and, even with the comparatively light fumes given off by the gelatin, an hour and a half is lost after each blast before the men can return to the bottom. The use of stronger powder did not remove the necessity of re-blasting bottoms and only increased the quantity of gas, but it is possible that electric blasting might have been more successful, particularly in the cut holes. However, this was not tried because of the caving nature of the ground, which it is desirable to shake up no more than necessary, and because, for the same reason, the timbers must be kept within 5 to 10 ft. of the bottom, in which position they would be exposed to serious injury from a heavy blast.

Cycle of the Sinking Operations

After blasting the cut, mucking occupies one full shift, then comes the second blast, followed by picking down the hanging-wall and mucking for three or four shifts, timbering occupies a shift, and the blocking and lagging sometimes half a shift more. It is to be noted in this connection that there is no separate timber crew, but that the sets are placed and lined up under the direction of the boss timberman.

The timber is put in as soon as there is room above the muck pile which must now be cleaned up and the bottom searched for any missed holes or unburnt powder. For a strict rule is enforced that no drilling may be done until every bottom still existing has been located and plugged with a wooden peg, clearly to indicate its position to the oncoming shift. Thus, the next shift need take nobody's word as to the presence or absence of any missed holes, and all danger of drilling into one is removed.

The total time occupied in drilling, blasting, mucking, and timbering for an advance of five to six feet is three days, resulting in a monthly advance of 50 to 60 ft., when there are no Sunday lay-offs. But these are generally enforced in order to keep the men from getting "stale." For a rush month, however, our record is 60 ft. advance with one Sunday lay-off.

Bonus System Used

To keep the crew up to their work they are paid, besides their wages, a bonus (to be divided among themselves as they see fit) of $12 per ft. for every foot of advance above 50 ft., computed on the basis of a 31-day month.

On account of the necessity of keeping the mill going at full capacity, and the delays therefore occasioned in shaft sinking from inability to get the main skips for lowering timber and track as promptly as desired, progress is undoubtedly retarded. Yet by way of comparison with former sinking it is sufficient to say that it had always been considered impracticable to sink the shaft and keep the mill going at the same time, and that when this was first attempted an average advance of only 30 ft. per month was recorded, and that at a cost of $75 per foot.

The following costs per foot are for a total of 283 ft. of sinking completed during 1910, and include the cost of cleaning out the sump twice after sinking had been discontinued for several months. Power cost $4.50 per horsepower-month, powder $11 per 100 ft., and timber $21.50 per M. No distribution of the cost of drill repairs, steel, or tools is at the moment available, but the cost of these items per foot of advance would be exceedingly small.

Cost of sinking per foot of shaft was: Drillers, $19.94; engineers, $5.54; timberman, $0.78; powder, $3.74; fuse, $0.48; caps, $0.10; candles, $0.56; timber, $8.13; track, $1.07; power, (hoist), $1.67; power (drills), $1.10; total $43.11.

Driving Crosscuts

For driving crosscuts the conditions, as stated earlier, are much more favorable than for shaft sinking; hence more emphasis is laid on speed. Yet for the sake of economy only two eight-hour shifts are employed, and but one drill, mounted on a crossbar.

The crosscuts referred to here are those driven from the shaft station a distance of about 330 ft. to the vein behind the shaft, and about 50 ft. further into the foot-wall of the vein. They do not include other crosscuts in the mine, most of which are narrower, in softer ground, and so considerably cheaper to drive, but which are not advanced at such high speed.

These shaft crosscuts first turn south from the shaft stations, then turn west across the formation. For the first 300 ft. they pass through schists and slates, next 10 to 50 ft. of vein matter consisting of quartz and gouge, and finally about 50 ft. of hard "greenstone" forming the foot-wall of the vein. The costs, therefore, represent extremely varying conditions, and the speed varies accordingly from 5 ft. to 10 ft. per day. The first 30 ft. of a shaft crosscut is run on company time, because the men are much hampered by the work still progressing in the unfinished station and pocket. The next section running 300 ft. west to the hanging-wall of the vein is done on contract at $3.75 per foot for all labor; and finally the remaining portion through the vein and into the foot-wall is again done on company time, wages being $3 for machine men, $2.75 for helpers, and $2.50 for car men.

Each shift comprises four men, namely a machine man, a chuck-tender, and two car men, and since 3½ hours elapse between shifts, they work unhindered by smoke and gas, except in the rare instances when a round is not completed by one shift and has to be finished and blasted by the next shift before they can commence on their own round.

A 2¾-in. Sergeant drill is used, with steel interchangeable with that in use in the shaft. The machine is mounted on a 6-ft. cross-bar, which together with blocking makes a width of 7 ft. for the drifts, while the hight is 8 ft. The round consists of never less than 12 holes, in four rows, namely 3 back holes, 3 breast holes, 3 cuts, and 3 lifters, drilled to reach 6 ft. ahead of the face and to break at least 5 ft. of ground.

In starting the crosscut from the station an advance of 8 ft. per day is made, in turning the corner usually 9 ft. and on contract on the straightaway to the vein 9½ to 11 ft. per day. In cutting the vein, however, not more than 5 ft. per day can be safely made, because of caving ground and the necessity of close timbering (charged to the drift); while in the foot-wall greenstone from 4 ft. to 8 ft. is made, depending on whether one round or two can be drilled in 24 hours in this exceedingly hard formation.

Sunday Lay-off Compulsory

No work is done on Sundays, for the reason that the strenuous contractors discovered that, if they worked every day, though they made more money, they required a lay-off afterward, spent more and kept less of their pay than if they rested one day per week as do the other miners. This arrangement also proved to be advantageous from the point of view of the management in that good men are not lost to the company during a protracted spree after a period of exceptionally hard work, and do not come back penniless and discontented, swearing there is no money in contracts. Hence the Sunday lay-off, originally voluntary, is now enforced except in cases of emergency.

Everyone who has tried fast driving knows that the great difficulty is to get the muck away. For, if one machine cannot drill the round in one shift, two can; yet only two shovelers can work to advantage in an ordinary mine drift or crosscut. Indeed, most of the success here in rapid driving is due to the inclusion of the car men in the contract with the machine men. The object, therefore, is to drive a crosscut just wide enough for two shovelers to work in, one on each side of the car, but slightly in front of it, and yet not to give them any unnecessary labor. This width has been determined upon at 6½ to 7 ft., and the hight, in order to give good ventilation in a hot mine, at eight feet.

Sometimes the car men are sent into the breast a couple of hours ahead of the drillers, but the advantage expected by this arrangement has never been secured, for the hours are then incon-

venient and complained of by the shovelers, who seem to work better when crowded in with the rest of the crew.

ROUTINE OF MUCKING IN CROSSCUTS

On first coming to work all hands aid pulling back the top of the muck pile, and in setting up the crossbar over it and fairly close to the back, from which position the top three rows of holes are drilled, and back holes being drilled over the bar, and the breast and cut holes from underneath it. Then, while the machine is drilling these nine holes, the greater part of the muck pile must be shoveled and trammed to the station pocket. Not having removed all the muck from the breast, the car men, "spelled" by the drill runners, next shovel back the last of the pile, and clean out the breast so as to enable the bar to be reset close to the ground in order that the lifters may be drilled. Thus the last of the muck is handled twice, a labor that might perhaps be avoided if the shovelers would consent more cheerfully to commencing their shift before the machine men. Yet, since they are able to complete their task in the shift, the management has no reason to complain. Then, while the lifters are being drilled there remains only to shovel and tram the last of the waste, to lay track and to load and blast the round.

At times it would be possible by using three shifts and a shorter round, to advance at the rate of from 12 to 15 ft. per day. But this arrangement would undoubtedly result in the long run in a higher cost per foot. Hence the two shifts are preferred, and, they, after turning the corner at the station, advance 60 ft. for a 6-day week with commendable regularity.

The cost of different supplies used in the crosscuts is the same as given for shaft sinking. The cost per foot for a total of 741 ft. of shaft crosscutting done during 1910 was as follows: Drillers, $2.34; car men, $1.62; powder, $1.28; fuse, $0.11; caps, $0.03; candles, $0.08; power, $0.51; track, $0.18; total, $6.15.

Looking back over performances previous to 1909 it is now hard to realize that an advance of 5 ft. a day in one of these crosscuts should have been considered satisfactory for the present rate of progress is accomplished more smoothly and apparently almost as easily as the former one.

The photographs used in connection with Mr. Ross' article, "Mining Operations in Peru in 1910," in the JOURNAL of March 4, 1911, should have been credited to C. L. Chester, who owns the proprietary rights therein and through whose courtesy we were enabled to present these illustrations. Credit was inadvertently omitted in the original article.

Lake Superior Iron Ore

Full statistics of rail shipments of Lake Superior iron ore have now been obtained and are published by the Cleveland *Iron Trade Review*. The actual rail shipments were about 36,000 tons less than the estimate made in January; the total shipments for two years past having been as follows, in long tons:

	1909.	1910.	Changes.
By lake....	41,683,599	42,628,758	I. 945,159
By rail.....	903,270	813,639	D. 89,631
Total.....	42,586,869	43,442,397	I. 855,528

The totals for four years previous to 1909 were: 26,014,987 tons in 1908; 42,266,668 in 1907; 38,565,762 in 1906; and 34,384,116 tons in 1905. The shipments in 1910 were the largest on record.

The division of shipments by ranges for two years is as follows, in long tons:

Range.	1909.	1910.	Changes.
Marquette..	4,256,172	4,392,726	I. 136,554
Menominee.	4,875,385	4,237,738	D. 637,647
Gogebic....	4,088,057	4,315,314	I. 227,257
Vermilion...	1,108,215	1,203,177	I. 94,962
Mesabi.....	28,176,281	29,201,760	I.1,025,474
Baraboo....	82,759	91,682	I. 8,923
Total....	42,586,869	43,442,397	I. 855,528

In addition to the above shipments from the two Canadian ranges in 1910 were 188,260 tons; 72,470 tons coming from the Moose Mountain range, while the Helen mine on the Michipicoten shipped 115,790 tons, all of which went to the Lake Superior Corporation at Sault Ste. Marie.

The statistics of shipments from the region have been so well kept that it is possible to give the total shipments of each range from its opening to the close of 1910, as follows, in long tons:

Range.	Year Opened.	Total Shipments.	Per Cent.
Marquette.....	1850	96,296,715	19.5
Menominee.....	1877	75,450,793	15.3
Gogebic.....	1884	65,135,817	13.2
Vermilion.....	1884	30,328,562	6.2
Mesabi.....	1892	224,905,184	45.6
Baraboo.....	1903	972,309	0.2
Total.....		493,089,380	100.0

The total number of mines which shipped ore in 1910 was: Marquette range, 28; Menominee, 37; Gogebic, 23; Vermilion, 6; Mesabi, 101; Baraboo, 2; total, 197 mines. No shipments are yet reported from the new Cuyuna range. The heavier shippers on each range in 1910 were as follows: Marquette: Cleveland-Cliffs group, 995,374 tons; Negaunee, 348,818. Menominee; Chapin, 465,543; Pewabic, 380,376. Gogebic: Norrie Group, 1,333,006; Newport, 1,182,324. Vermilion: Pioneer, 526,435; Zenith, 283,320. Mesabi: Hull-Rust, 3,189,975; Mahoning, 1,515,723; Fayal, 1,485,099; Morris, 1,364,673; Adam, 1,258,595; Canisteo, 1,105,160; Burt, 1,032,815 tons. Nine mines—seven on the Mesabi and two on the Gogebic—shipped over 1,000,000 tons each. The Sellers and the Virginia on the Mesabi and the Cleveland Cliffs group on the Marquette came close to the million-ton line, but did not quite reach it.

The Mesabi range far surpasses all the others, notwithstanding its later date of opening. New developments have been made on all the ranges in the past two years, but those on the Mesabi are much the most extensive.

The shipments of the mines owned or controlled by the United States Steel Corporation were 49.9 per cent. of the total, against 50.4 per cent. in 1909. The highest proportion of the total ever reported by the Steel Corporation was in 1907, when it was 56 per cent. of the total.

Caballos District, Sierra County, New Mexico

BY BRIGHAM LEATHERBEE*

The Caballos mining district of Sierra county, New Mexico, is attracting much attention at present among mining men, owing to the activity of the Vanadium Mines Company. This company is now mining and concentrating vanadium ores, and will, in all probability, be reducing its concentrates within a few weeks, as it is hoped that the new oxide plant at Cutter will then be in operation.

At present the company is working its White Swan mine, which has a fissure vein, carrying vanadium ore. A standard two-compartment shaft is now down on this vein about 175 ft., with levels driven at 80 and 140 ft. This is equipped with an electric hoist. About one-quarter of a mile west from the White Swan is another fissure vein of vanadium ore known as the Dewey. A prospect shaft on this vein is now down about 75 ft. in good ore, and is operated by a 40-h.p. steam hoist.

The old mill of the Southwest Lead and Coal Company, to which company the new corporation succeeded, has been remodeled and is being used as a concentrating mill. It is running continuously, treating on an average about 40 tons in 24 hours.

Electric power for the mines, mill and camp is furnished from the power plant about four miles distant from the mines, where is the nearest available water. Two 125-h.p. horizontal tubular boilers operate a 200-h.p. Monarch corliss engine directly connected with a 110-kw. alternating-current generator.

Upon the completion of the new oxide plant at Cutter, which will cost about $100,000, the concentrates from the mill in the Caballos will be hauled there for treatment, with the probable daily production of 2000 lb. of vanadium pentoxide. Late reports from Cutter announce that in drilling the wells to supply the new plant with water, a large body of potter's clay has been discovered and that this will be developed by the company.

*Hillsboro, New Mexico.

Scientific Management of Work

By Arthur W. Page

Enlightened management consists in studying each class of work done, and after selecting the best men for that work, spurring them on by a bonus system.

Scientific management is a system of conducting industrial plants evolved as the result of 26 years of work by Frederick W. Taylor in the Midvale Steel Works in Philadelphia. Mr. Taylor gives, under four heads, the steps necessary for the practice of "scientific management":

(1) Determine accurately by scientific analysis the elements of each piece of work and decide how it can best be done.

(2) Select men who are fitted for the work—even for the lowest kinds—and train them in the way that has been determined to be the best way of doing that task.

(3) By adequate supervision and a system of payment which gives the men an incentive, make sure that the men practise the best methods all the time.

(4) Divide the work between the management and the men so that the management does all the work which it can do better than the men.

After Mr. Taylor had spent many years in building up "scientific management" piece by piece in the Midvale Steel Works, he was asked to introduce it into the works of the Bethlehem Steel Company. At that plant there was a great yard, approximately two miles long and half a mile wide, in which there were about 600 men who shoveled sand, coal, ashes, etc.

Elements of Shovel Work

In accordance with his principle No. 1 Mr. Taylor began to study the science of shoveling. Most shovel contractors undoubtedly believe that the way to shovel is to shovel, and that there is no more science to it than a laborer will acquire by practice. At Bethlehem the men supplied their own shovels, which they chose to suit themselves, and each man worked according to his own method.

Mr. Taylor's analysis showed that a first-class man working at normal speed could handle more material on a shovel that held a 21-lb. load than on any other. A lighter load necessitated too high a speed, and a heavier load meant too great a strain on the man. He determined how much more quickly and easily a man could load his shovel with material from an iron or a wooden floor than from the ground. There were several other things which Mr. Taylor learned about the science of shoveling, but these will do by way of example.

In accordance with the second principle, that of selecting the men and training them—Mr. Taylor picked out the men and had them instructed one by one how to work and how fast to work, for there was a foreman to every small gang, to keep teaching such men as needed it.

Note—Abstracted from an article in *World's Work*, Feb., 1911.

The third principle was made effective by the "bonus" system of payment. These men had been accustomed to receive $1.15 a day for shoveling. Mr. Taylor allowed that rate to stand. If a man merely shoveled until the whistle blew, he got his $1.15, as usual. If, however, he profited by the teaching and did the whole task assigned him, he received $1.85 a day. This 70c. extra a day was the inducement given to make the men use the science which they had been taught.

Living up to the fourth principle necessitated many changes. A tool house was built and supplied with eight different kinds of shovels, some for ashes, others for coal, etc.—for, obviously, a shovel that will hold 21 lb. of one material would not necessarily hold the same weight of another. A planning department was established to determine just what work should be done each day and by what men. This department gave each man a card every morning, telling him just where to go in the yard, just what to do, what tools to do it with and how long it ought to take him. These details were formerly decided by the gang-boss and by the men themselves in a haphazard manner. Under Mr. Taylor they were determined by specialists upon exact information, and the planning office knew at the end of every day just what each man had accomplished.

Results Accomplished under Scientific Management

At first sight it would seem a lot of useless red tape—as if a man who had shoveled for fifteen years would not know how to do it. But the results proved it otherwise, for the number of laborers was reduced from 600 to 140; the average number of tons handled per man per day was increased from 16 to 59; the average earnings per man per day rose from $1.15 to $1.88; and the average cost of handling a long ton (2240 lb.) decreased from 7.2c. to 3.3 cents.

In the 3.3c. per ton for the cost of handling is included the wages of all the men in the planning department, the timekeepers, etc. During the first year the saving was $36,417, and in the next six months (when the system was further perfected) the saving was about as much more—or a total of approximately $72,000 in 18 months. This had been accomplished without overworking the men, for one fundamental idea underlying "scientific management" is that the men who are trained be induced to stay permanently, and this could not be done if they were overworked.

The obvious result of the analysis of the science of shoveling was to supply the men with the proper tools. That, of course, is not a new idea, but it is one that is often overlooked because the work which the man is required to do has not been studied. It is usual to accept the tools in common use, and more usual to accept the method of handling them which the workmen happen to have acquired. If a better tool or a better method is brought to the attention of the management, it will usually be accepted. Scientific analysis of each piece of work determines whether or not the tools and the methods are the best that can be had; and, if not, wherein they are deficient. A trained man can naturally do this analyzing better than an untrained workman.

In the shovel gang at Bethlehem, Mr. Taylor found that by far the larger proportion of the men were unsuited to the work. Some were physically below normal and others were mentally fitted for a higher grade of work. A number of the better men received better jobs in other parts of the plant. The incapables were sifted out. At the end of the year the 140 men who were doing the work of the old gang of 600 could and did fulfil the regulations of 59 tons a day.

But even after the right men had been selected and supplied with the proper tools and taught the proper methods, they would not have been willing to shovel 59 tons a day for $1.15, for it is against all "union" rules to do so much work that it throws other men out of work, while human nature does not encourage a man to produce added results for his employer without recompense to himself. The 70c. a day extra was the incentive that made the men do this.

Why Bonus System is Better Than Contract System

Extra pay for extra work is no new idea, as piece-work is a recognized method of payment all over the country. But there is one vital difference between piece-wages and the bonus system. If piece-work had been introduced in the shovel gang at Bethlehem, the result would have been somewhat as follows:

The average movement of the gang was 16 tons per day per man. The wage was $1.15, or a fraction less than 7.2c. per ton. If that was the piece-rate and some of the stronger men should, without instruction or better tools, shovel 25 tons instead of 16, they would be earning $1.80 a day. The management would know that $1.15 was what was paid elsewhere, and as soon as the labor market became glutted it would reduce the rate per ton to five cents. To make the old wage of $1.15, a man must then shovel 23 tons a day instead of 16. This speeding-up process has been worked so often that the labor unions are on the watch for it. The trouble is that the rate is based on the previous performance of the workers, or on the record of another company, or on the manager's guess, or on some other data which do not show what a normal man's day's work at that particular job ought to be. This speeding-up process, a system of penalizing labor for its own extra efforts, is naturally a frequent cause of strikes. Under the bonus system, on the other hand, what a normal day's work is can be accurately determined, and as this will not vary there is no occasion to change the rate of payment.

Results with the Bonus System

The bonus system does not pay the men in proportion to the extra production, because that is due more to the work of the management than to them, but it does pay them more than any other laborers can earn on similar work where the management is not helping them. Moreover, it is to everyone's advantage in a bonus system that the standard be reached. If the workman fails to reach the standard, he loses his bonus. If a forman's gang fails to reach the standard, he loses his bonus. Unless everybody coöperates, the results are below standard and everybody loses. There is, therefore, the same social pressure of the laborers among themselves to make everyone accomplish his task under this system, which, under the piece-work system and under day wages, teaches the workman to do as little as possible for a given wage.

For labor's own interests it is better to work in an efficient shop than in an inefficient one, because only the efficient shops can afford to pay high wages. Every wasteful operation, every useless movement, has to be paid for by someone—and in the long run the workmen bear their share. But it often happens that shops which could pay high wages are unwilling to do so, and labor is naturally enough unwilling to do its utmost to make a shop efficient unless it gets its share of the profits. Having found itself hired and paid by classes, labor gradually organized by classes to protect its interests, and its ultimate resource of protest is the strike. A system which gives laborers individually even more than they demand by classes—that helps to remove the causes which produce strikes.

Why Scientific Management Pays

The shovelers at Bethlehem increased their daily handling from 16 tons to 59. The gang of pig-iron handlers increased their average movement from 12½ to 47½ long tons a day. But both these are low-grade work. It is hard for a man running a highly specialized machine shop with labor that is well paid and which has had long training, to believe that such increases in production could be accomplished in his shop. For example, he has a mechanic who has worked a certain machine for ten years. It stands to reason that this intelligent man knows how to get the most out of the machine. When he is given a piece of metal to cut, he knows from long practice what speed and what feed to use on the machine. He learned it from his predecessor and the men around him in the shop. But to see how likely it is that he has really learned how to run his machine for each job, it is necessary to look into the different things which affect the operation. The speed of the machine, the material to be cut, the kind of tool to be used and nine other separate and distinct things affect this operation. If the mechanic were a skilled mathematician and had accurate data showing how each of these things affected the operation he could figure out accurately what speed and what feed he should give his machine on a special job to obtain the best results. In analyzing the elements of this job, Mr. Taylor revolutionized the art of cutting metals. He found out the facts about the twelve things which affect the speed and the feed to be used on a machine cutting metal, and he has made a slide rule that will do the day's calculating in about twenty seconds. In some cases this has enabled mechanics to cut three times as much metal as they cut before.

What Scientific Management Is

Many people get the impression that "scientific management" consists of slide rules, instruction cards, eight sets of shovels and the like. In reality, the appliances are the least important part of it. The main thing is, first, to get the accurate information and, second, to continuously apply it. To accomplish this, the selection and training of men, the systematic planning of how work shall be done, in what time and by whom, and the bonus system of wages have been found necessary.

In a foundry under "scientific management" every man had an instruction card telling him all he needed to know about his job. The materials which he was to work with and his tools had been brought to him. The men were working steadily and rather quickly, although there was no appearance of haste. Time was saved by knowing what to do and in having the proper facilities for doing it. No time was wasted going after tools or asking questions of the foreman. Yet, in spite of the minuteness of their instructions, there were two foremen—really teachers—in one small room. Under the usual management there would have been one foreman, and he, besides keeping the men at work, would have had to answer their questions and decide off-hand how and by whom each piece of work was to be done. Thus overburdened, the foreman must necessarily leave the men pretty much to their own devices, which is unfortunate.

Besides these extra foremen there were the time-study men, who collected the data on which the instructions were based; the planning department, the strategists of the plant, who planned just what part each man was to take in each day's operations, so that everything would move in harmony; and the specialists, whose knowledge was necessary for the making of proper instructions. Each man was supreme in his own specialty, and each had his particular duty. If any one failed, it could be noted immediately where actual performance deviated from the plan, and if it were the fault of the president of the company it showed as plainly as if it were that of a workman, for accuracy is no respecter of persons. A plant operating under "scientific management" is an industrial democracy.

Native Mercury in Australia

According to a correspondent of the London *Mining Journal*, an official report states that native mercury has been found at Hyponga, eight miles from Willunga, South Australia, in a country consisting of clay slate, graphite slate, phyllite, mica schist, and quartzite. The beds are overlain by comparatively recent detritus deposits, with much white quartz and nodular ironstone. The country is auriferous, and several abandoned gold mines exist in the vicinity, but no well-defined lode or body of ore occurs in the beds traversed by the tunnels in which the mercury is met with. The mercury is found in the elementary form as small globules distributed over the rocks in the tunnels, but of extemely small size. At present the peculiar manner in which the mercury appears remains a scientific mystery.

With the highly pyritic Mount Morgan ores it is often necessary to install spray nozzles in the drives (*Queensland Govt. Min. Journ.*, Dec. 15, 1910) to keep down the sulphur fumes so as to permit work being carried on.

Selling American Mines in London

By F. Close *

Undeveloped prospects and exhausted mines usually offered for sale on statements backed by old reports. Buyers have learned caution and now prove mines before making payments.

*Conservative Club, London, S. W., Eng.

Some basis on which the views of vendors of American mines and prospective purchasers in London can be brought to coincide is much needed.

The usual state of affairs is at present somewhat as follows: Messrs. A, B and C, joint owners of a healthy prospect in Colorado, having agreed among themselves to sell their property, approach some mining engineer or intermediate vendor who has business connections in London, with a view to the sale of their prospect, the engineer to take a percentage of the selling price should he put the deal through. The property for sale is usually either wholly undeveloped, but in a likely part of the country, or a mine practically exhausted to water level, with probabilities of further ore below that, but requiring a shaft, and heavy pumps, or a long cross cut, to establish the fact.

Old Reports Usually Used

In the latter case the vendors have usually had some sort of a "hot-air" report made by a man with a smooth pen, and some experience, on a contingent fee basis (i. e., he receives a commission if the mine is sold on the strength of his report) and written five or six years previously, since which time they confess that leasers have taken out a little ore, which means they have been pulling the mine to pieces.

The report gives locality, altitude and some description of the mine and surrounding country. Relative to the veins, they are nearly always "true fissures" from which "large tonnages of smelting ore have been extracted," and the report ends by pointing out the enormous potentialities of wealth for anyone who will find the money to do the necessary crosscutting or sinking.

Attracted by the possibilities, the engineer, or intermediate vendor, before he spends a cent on going to see the property, will, if he is wise, ask Messrs. A, B and C on what terms they are prepared to grant a lease and option. Supposing $100,000 spread over a period of two years, is asked; if the property is worth anything at all it is probably worth that amount.

It is always the case, however, that intelligent investors in a lease and option insist on ample time being given after the papers are signed before any payment on account of purchase has to be made, in order to find out if the expected ore is in place.

This is where the trouble begins, the vendors claim that the first payment of 10 per cent. towards purchase price must be made within 30 days of the signing of the lease and bond. The engineer, well knowing that no reputable or experienced firm in London will even take the trouble to look at a report when an early payment is required, struggles for more time. He sticks out for at least four months for a mine with appreciable quantities of ore in sight, and, if the property is an undeveloped prospect, even though on a good vein and in a likely locality, sufficient time to do the necessary development work to prove the existence of profitable ore. This may well mean anywhere from nine to 18 months.

The engineer tells the vendors that his people will contract to spend an adequate sum of money per month on development work, up to the time set down for the first payment on account of purchase price, but the vendors continue to insist that the first payment be made 30 days after the signing of the lease, and there the whole matter usually ends.

Buyers Now Prove Mine Before Paying

The prospective purchaser's arguments are much as follows: To send an engineer over to examine the little that is to be seen, to go into matters of title, metallurgy of the ores of the district, tenor of ore in adjacent mines, and other data to find out if there is a good chance of payable ore being found on the property, will cost us at least $2500. Then, if our engineer's report is favorable, we will have to arrange for underwriting and flotation of a company over here, at an additional cost to us of $20,000, and all this will take three months at the very least. Further, we know from long experience at the business, that, out of every 10 prospects which are thought worth the while of sending out an expert to examine, only one is found to be sufficiently encouraging to go on with, and the money spent in examinations is lost. We have therefore no intention whatever of binding ourselves to pay anything on account of purchase price before we have had ample time to do the necessary prospecting work, and satisfy ourselves that the mine is worth exploring. Supposing we had paid $10,000 down toward the purchase price of the last fifteen properties visited by our engineers, none of which turned out to be any good, we would be $150,000 out of pocket, plus the cost of the examination we made.

The owners argue (to themselves) that the possession of a prospect or mine used to be an excellent business. "Suckers" came along every year or two and paid $5000 to $50,000 down for a lease and option, then would go East, presumably to get capital interested, only to fail on their next payment, and forfeit. The idea was to get a payment before the mine was developed.

The Sucker Crop Failing

It is a difficult matter to interest capital in London in a prospect, or a mine showing no ore in sight, at the best. Capital is much more wary than it used to be. Mine owners in Colorado and other States of the Union can give up all hope of ever persuading, through agents or otherwise, financiers to agree to make a payment on account of purchase previous to ample time for examination, flotation, and development purposes. "Suckers" may occasionally be found who will do so, but their number is becoming steadily less, as is shown by the hard time the professional "con" men are having, and, while waiting for one to turn up, owners of prospects and mines are losing valuable opportunities of having their properties taken up by companies really able to see the thing through.

Recently certain lease and options on prospects in the Orient have been taken over by European syndicates, the vendors asking for no cash consideration whatever, but a 30 per cent. interest in the company which will eventually be formed to work them, if six months' development work proves them to be worth taking up. What chance is there to interest capital in Colorado prospects on the terms demanded there when as good chances can be had elsewhere on much more reasonable terms?

It is true that it is occasionally not difficult to sell undeveloped properties adjoining claims on which phenomenal orebodies, causing a wild boom, have been found. This, however, can only be done during a boom in the district, and it appears to be about hopeless to expect any such frantic excitement in the developed camps of Colorado. If owners of mines and prospects there insist on waiting for such a boom before listening to the terms capitalists are nowadays prepared to order, they are waiting for an event which in all probability will never occur again.

New Mill at Nevada Wonder Mine

By P. E. Van Saun*

Interesting departures in crushing and cyaniding equipment. Stamps weigh 1400 lb. Slime-collecting tank introduced above agitators to save time. Oliver continuous slime filter used.

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The property of the Nevada Wonder Mining Company is situated at Wonder, Churchill county, Nev. It is reached via the Southern Pacific Railroad, by a branch connecting with the main line at Hazen, Nev., about 28 miles in length, to Fallon. From this town a fairly good automobile or stage route of 65 miles extends in a southeasterly direction to the mines.

The mines were developed before the advisability of a mill was determined, both tunnels and shafts being opened to the various orebodies. It is the intention of the management to employ the principal shaft, which has been sunk to a depth of 500 ft., for the mill ore supply; this shaft connects with the main orebodies, namely, the Wonder and Badger veins.

Treatment of Ores

The principal ores are unusually hard, tough, oxidized quartz, carrying a small percentage of high-grade sulphides, and both gold and silver. The silver in the sulphides is mainly in the form of argentite and stephanite and some native silver. The gold is principally free, occurring to a small extent in combination with the sulphides but mainly scattered in fine particles throughout the ore, and is in a favorable condition for extraction. Before the type or arrangement of the plant was determined, extensive tests were made to decide the most suitable method of pulverization and subsequent treatment. The proper treatment was thus conclusively shown to be crushing to a slime of 200 mesh and finer, concentration on slime tables to remove the greater portion of sulphide and native silver, and cyanidation of the tailings for the recovery of the remaining gold and silver.

While for the intermediate crushing following the breaker, rolls would be usually adopted, in this case owing to the extremely hard and tough character of the ores 1400-lb. stamps were determined upon, crushing to four mesh, followed by chilean and tube mills for the fine grinding and sliming.

The ores will be brought to the surface by a 75-h.p. electric hoist placed at the level of the collar of the shaft. This hoist will be operated with the latest improved system of automatic electrical contactors, which insure against burning of contacts or other causes of interruption of service incident to a more crude system of control. The mine equipment includes a motor-driven, two-stage compressor for operating the mine drills, drill sharpener and ore gates. A motor-driven No. 6 exhaust fan connected with the mine workings affords ventilation.

A counterbalanced safety cage will raise the 16-cu.ft. steel cars to a track at the level of the collar of the shaft from which they will be trammed a distance of about 30 ft. to the ore-storage bin, of 300 tons capacity. This bin will be equipped with three pneumatically operated arc-type ore gates, which empty into a train of three 72-cu.ft. side-discharge roller-bearing steel ore cars. These bin gates are arranged so that all three cars may be filled from the respective gates without moving the train. A 24-in. gage surface tram line about 800 ft. long, on which the car train will be drawn by animal power, extends from this bin to the mill, the track grade being such that equal effort is required to haul the loaded cars and return the empties.

Mill Site and Foundations

The mill site is located on a slope averaging about 22 deg. and extending downward toward the east. The formation consists of a surface wash averaging about 5 ft. in depth. Beneath this the strata are composed variously of white and light blue kaolinized andesite and brown andesite, affording excellent foundation supports for the heavy machinery and equipment of the mill. There are nine benches or floor levels in the mill proper. The retaining walls and building piers are constructed of portland-cement concrete except in certain minor locations, where their duty is such that stone masonry was found suitable. All broken stone used in concrete was screened to size and fines removed to secure maximum strength. The high retaining walls are buttressed to give the requisite stability and economize in concrete. All machinery foundations are particularly high grade, the stamp concrete-mortar blocks being of monolithic construction securely reinforced with twisted steel rods. All of the sand for the concrete had to be mule packed in 100-lb. sacks for several miles.

Two Views of the Nevada Wonder Mill, Churchill County, Nevada

Building Construction

The over-all dimensions of the mill building are about 250x120 ft. wide; the framework of the buildings, bins and the interior woodwork is constructed of Truckee pine, the stamp-battery timbers being of seasoned Oregon pine. The buildings are roofed and sided with galvanized corrugated steel. All supporting timbers are carried on masonry foundations, the high building over the air-agitating and aërating tanks being secured to substantial concrete foundations by steel anchor bars embedded in the concrete so as to withstand wind pressure.

Mill Equipment

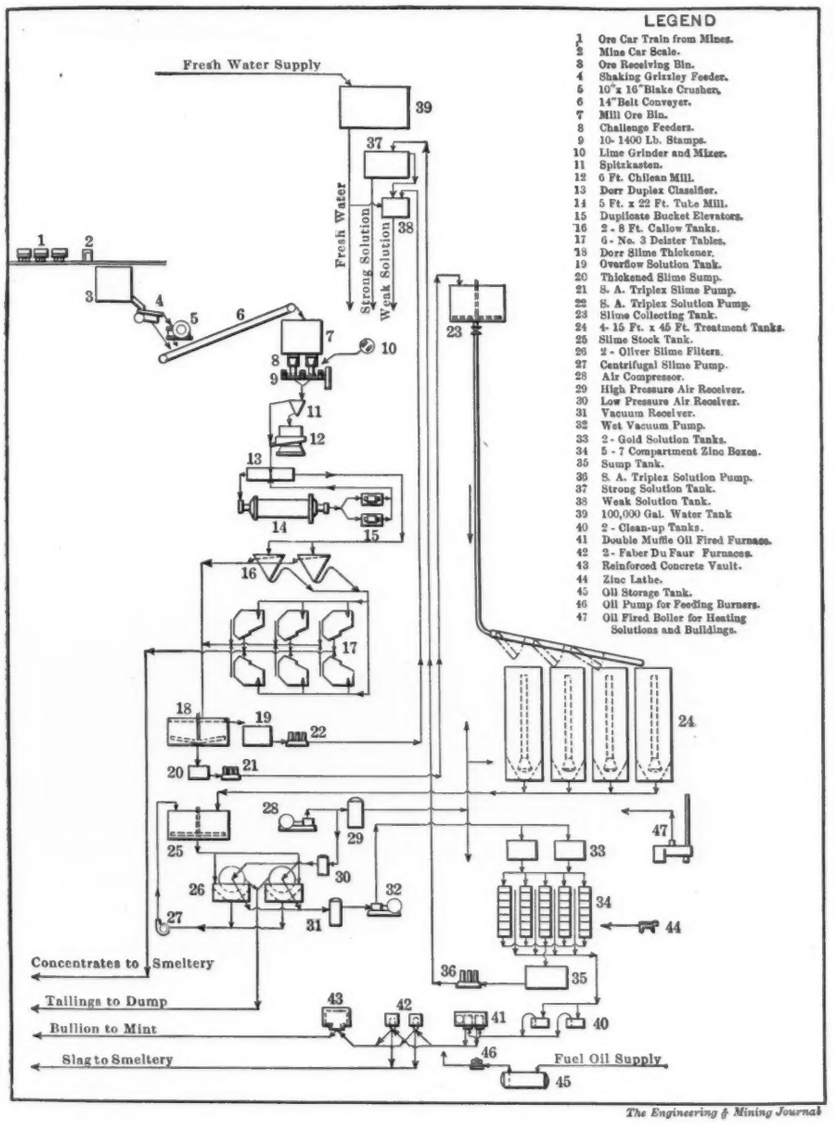
The method of treatment may be followed by reference to the accompanying flow diagram. The loaded ore cars pass over a track scale where the weight of the ore delivered to the receiving bin is ascertained. From this bin the ore passes through a 30x40-in. double-rack gate to an improved shaking-grizzly feeder. This machine is driven from a pulley on the crusher shaft, and has a slow-advance and quick-return motion, with a falling action on the back stroke which overcomes choking, particularly since the screening medium is constructed of taper steel bars. The stroke can be conveniently regulated from 0 to 4 in. The oversize from the shaking grizzly is thus mechanically fed to a 16x10-in. Blake crusher, equipped with safety shearing toggles, the crushed product from which is combined with the through product from the shaking grizzly, and is discharged on the troughed belt conveyer which delivers the ore, crushed to about 1¼-in. ring and finer, into the mill bin. From this bin the ore is discharged through two 20x24-in. rack-and-pinion gates to two Challenge feeders which feed the two five-stamp mortars.

The 1400-pound Stamps

The stamps are installed in a battery of 10 operated from a single cam shaft. They are the heaviest used in this country, being of 1400-lb. weight each, and will be run at about 96 drops per minute. The cams and also the cam-shaft pulley are secured to the shaft by Canda self-tightening fastenings. The pulley has a 90-in. diameter and a 19-in. face. The Oregon pine battery frame is secured to the concrete foundation by heavy tie bars, the king posts resting in cast-iron sockets with rubber pads beneath.

The mortars are massively constructed of cast iron with interlocking steel liners, no bolts being used for securing liners in place. They are machined on the bottom and are set on a rubber pad resting on the concrete foundation, so as to secure a uniform bearing, the anchor bolts holding them in place being arranged so as to be easily replaceable in case of breakage. Each mortar weighs 12,000 lb. exclusive of linings. A grinding and mixing mill for supplying lime solution is placed above the stamp level.

The stamped ore, crushed in weak cyanide solution to pass 4-mesh "ton cap" wire screen, is fed to a spitzkasten, where the fine material with surplus solution is removed, and the coarser spigot product delivered to a 6-ft. chilean mill, where it is further crushed in weak cyanide solution to pass 30-mesh "ton cap" screen; this product, after uniting with the fine overflow product from the spitzkasten, is delivered to the Dorr duplex classifier.


LEGEND
1 Ore Car Train from Mines.
2 Mine Car Scale.
3 Ore Receiving Bin.
4 Shaking Grizzley Feeder.
5 10"x 16"Blake Crusher.
6 14"Belt Conveyer.
7 Mill Ore Bin.
8 Challenge Feeders.
9 10- 1400 Lb. Stamps.
10 Lime Grinder and Mixer.
11 Spitzkasten.
12 6 Ft. Chilean Mill.
13 Dorr Duplex Classifier.
14 5 Ft. x 22 Ft. Tube Mill.
15 Duplicate Bucket Elevators.
16 2 - 8 Ft. Callow Tanks.
17 6 - No. 3 Deister Tables.
18 Dorr Slime Thickener.
19 Overflow Solution Tank.
20 Thickened Slime Sump.
21 S. A. Triplex Slime Pump.
22 S. A. Triplex Solution Pump.
23 Slime Collecting Tank.
24 4- 15 Ft. x 45 Ft. Treatment Tanks.
25 Slime Stock Tank.
26 2 - Oliver Slime Filters.
27 Centrifugal Slime Pump.
28 Air Compressor.
29 High Pressure Air Receiver.
30 Low Pressure Air Receiver.
31 Vacuum Receiver.
32 Wet Vacuum Pump.
33 2 - Gold Solution Tanks.
34 5 - 7 Compartment Zinc Boxes.
35 Sump Tank.
36 S. A. Triplex Solution Pump.
37 Strong Solution Tank.
38 Weak Solution Tank.
39 100,000 Gal. Water Tank
40 2 - Clean-up Tanks.
41 Double Muffle Oil Fired Furnace.
42 2 - Faber Du Faur Furnaces.
43 Reinforced Concrete Vault.
44 Zinc Lathe.
45 Oil Storage Tank.
46 Oil Pump for Feeding Burners.
47 Oil Fired Boiler for Heating Solutions and Buildings.
Fresh Water Supply
Fresh Water
Strong Solution
Weak Solution
Concentrates to Smeltery
Tailings to Dump
Bullion to Mint
Slag to Smeltery
Fuel Oil Supply
The Engineering & Mining Journal

Flow Diagram of Nevada Wonder Concentrating and Cyanide Plant

Production of Slimes

From the Dorr classifier all slime material 200 mesh and finer, which has been produced in the previous crushing operations, is at once removed, the sand product requiring further reduction, being delivered to a scoop-feed, wet-grinding 5x22-ft. tube mill with ribbed lining, which also grinds in weak cyanide solution. From the tube mill the product is delivered by either of two bucket elevators back into the Dorr classifier, so that any material which may not have been sufficiently reduced will be returned to the tube mill. It will thus be seen that by reason of the closed circuit referred to, all material will necessarily be reduced to slime before being overflowed from the Dorr classifier to the two 8-ft. Callow tanks. In these the product is thickened to suitable consistency for concentration, and fed to six No. 3 Deister slime tables, where the sulphides and native silver are removed. The tailings from the concentrators and the overflow product from the Callow tanks are together delivered to a Dorr thickening tank, where the slime is thickened to a consistency of about two tons solution to one ton of ore for final cyanide treatment. The clarified overflow solution from the thickener flows to a sump tank and is from thence returned by a single-acting, triplex pump to the weak solution tank for reuse.

Cyanide Treatment of Slimed Product

The thickened slime flows into a concrete sump from whence it is delivered by a single-acting, triplex, slime pump to a slime-collecting tank with mechanical agitator, and placed at a level sufficiently above the top of the treatment tanks as to allow the pulp to flow to them by gravity. By the use of this novel feature the time otherwise lost in treatment by the customary practice of using the treatment tanks for collecting the pulp is largely saved, as in the former case about 24 hours would be required for filling a treatment tank, whereas, in the

method employed, this time is reduced to about half an hour.

Four treatment tanks 45 ft. high and 15 ft. in diameter are installed in which the product is agitated and aërated in strong cyanide solution for about 48 hours. An important improvement in the aërating system is utilized by which the air is finely divided so as to secure more efficient oxidization in its passage through the pulp, and thus afford more rapid and economical extraction. When the treatment in any one of these tanks is completed, the pulp is discharged into the stock tank provided with mechanical agitator to prevent settling. This tank serves as a reservoir for continuously feeding the two Oliver slime filters. These filters are continuous in their operation, the solution containing the gold and silver being drawn through a receiver by means of a wet vacuum pump and discharged into either of two gold-solution tanks. From these tanks the solution is run through five 7-compartment zinc boxes, where the gold and silver are precipitated on zinc shavings, the discharged barren solution flowing to the sump tank from which it is returned by a single-acting triplex pump to the strong-solution tank for reuse.

The gold and silver precipitates recovered from the zinc-box cleanup are washed in either of the two cleanup tanks, decanted and charged into a double-muffle, oil-fired furnace, where they are dried and partially roasted. This furnace is specially built of steel and cast-iron construction, and lined with highly refractory material. The dried precipitates, after mixing with the necessary fluxes, are charged into the two Faber du Faur furnaces, where the contained zinc is eliminated by volatilization, the melted bullion cast into ingots ready for the mint and the slag run into molds which will be shipped to the smeltery. A reinforced-concrete vault with fire- and burglar-proof doors is built for storing precipitates and bullion.

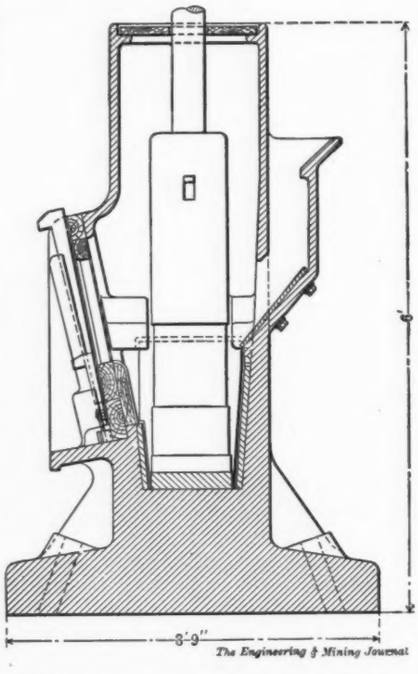
General Equipment of Plant

The mill will be electrically driven throughout, on the subdivided-unit system, there being seven motors developing an aggregate of 245 rated h.p. The alternating current is delivered to the switchboard at 440 volts, and is three-phase, 60-cycle, 7200 alternations per minute. The buildings are lighted by the two-wire system, both arc and incandescent lamps being used.

The generating station is located near Lundy, on Mono creek, Mono county, Cal., on the eastern slope of the Sierra Nevada range; the distance to the mill-site being about 125 miles. The line current is three phase, 60-cycle, 7200 alternations, and is transmitted at 52,000 volts over No. 4 wire. This line current will be delivered to the transformers in a building isolated from the mill, and will, therefore, be delivered to the mill switchboard at the reduced voltage.

An oil-fired locomotive-type boiler is utilized for heating solutions to facilitate extraction and for heating the building in winter, using the direct system of radiation. The oil-supply tank is placed below the plant to avoid danger from fire, and the oil pumped to the various burners. Both compressed air and steam are used for atomizing, as best suited.

The water for use at the plant is piped a distance of 10¾ miles, the line being stepped of 6-, 5- and 4-in. steel pipe. The maximum head at the lowest portion of the line is 2100 ft., and at the delivery point 400 ft., where it discharges into a 30-ft. diameter by 20-ft. stave redwood storage tank of 100,000 gal. capacity. The pipe line and tank are complete and have been in commission over two months. As will be seen in the illustration, the tank is situated at a level considerably above the mill and mine, but is placed so that in case of overflow or accident, it will not wash down to the mill and cause damage. From this tank a 5-in. line extends to the plant. Branches are provided for fire protection at the mine, in the mill, and outside of the buildings.



Sectional View of Stamp Mortar

A separate building about 21x54 ft., placed at the stamp-floor level and about 30 ft. from the mill building, is for general repairing and storage purposes. The shop equipment will take the largest work usually required and comprises an oil-fired forge, lathe, drill press, pipe machine, grinder and an ample assortment of small tools. It is electric motor driven and steam heated.

In the design and construction of this plant, the transportation of materials has been an important factor for consideration since in addition to the cost of railroad freighting, the 65-mile wagon haul was expensive and tedious. A large number of wagon teams were employed in addition to two "caterpillar" gasolene traction engines, especially adapted to desert hauling. The plant, including the mine surface equipment, was designed and is being built by the Mill and Smelter Engineering Company, of New York, which contracted for the complete equipment and construction of the mill, including all excavating, grading and foundation work. The plant is nearing completion and should be in regular operation the coming spring.

Osceola Annual Report

The report of the Osceola Consolidated Mining Company for the six months ended Dec. 31, 1910, shows dividends paid of 33⅓ per cent., with a decrease of $10,614 in the surplus. The recovery of copper per ton of rock continues to decrease, being 17.1 lb. in 1908, 16.9 lb. in 1909, and 15.9 lb. in 1910. However, cost per pound of refined copper likewise went down, being 10.53c. in 1908, 9.47c. in 1909, and 9.37c. in 1910.

The production was 19,346,566 lb. of copper from 1,217,720 tons of rock, at a cost for mining, transportation, treatment, etc., of $1.28 per ton of rock. The recovery was 25,669,913 lb. of crude mineral from which the copper recovery was 75.367 per cent. The cost at the mine per pound of copper, excluding construction, was 8.04c.; construction, 0.35c.; smelting, freight, commission, Eastern office, etc., 0.98c.; total, 9.37c., as given above.

The Osceola branch was closed after March 1, 1910, owing to low copper contents and the low price of copper, so that only 62 ft. of sinking and 1484 ft. of tunneling was done. The Osceola No. 5 shaft is now 4623 ft. deep. The South Kearsarge orebody is now well delimited, and it is computed that its life will be only four or five years more. Here 213 ft. of sinking and 1440 ft. of tunneling was done. At the North Kearsarge no sinking was done and 7327 ft. of openings made.

The construction was of small moment, except at the mill, where a portion is being remodeled to make a better extraction on the Kearsarge amygdaloid. On this the mill has not been making a satisfactory recovery, although it has on the Osceola ore. From 1900 to 1910, inclusive, this company has paid $65 in dividends, on a par of $25 per share.

The transmission lines from Niagara Falls to Dundas, Canada, were recently tested under a pressure of 165,000 volts, according to the *Electrical World.*

Pulmonary Diseases among Miners

By Frederick L. Hoffman *

Western Australian statistics of unusual importance proving that miners suffer more from lung diseases than workmen employed in other industries.

*Statistician, Prudential Life Insurance Company, Newark, N. J.

Early in 1910 a Royal Commission was appointed by the Governor of Western Australia to investigate and report upon (*a*) the prevalence among miners of pulmonary diseases, (*b*) the nature of such diseases, and (*c*) the extent to which they are associated with or consequent on mining. The Commission consisted of only a single Commissioner, the Hon. John Howard Lidgett Cumpston, M. D., B. S., D. P. H., who under date of October 4, 1910, rendered his report which constitutes a valuable contribution to the limited literature of miners' lung diseases whether of tubercular or nontubercular origin. The report, in an admirably condensed form, contains a considerable amount of entirely new information on the subject and all the essential facts and conditions are discussed with rare lucidity and ability to bring the results within range of a layman's point of view.

Medical Data of Value to Mine Managers

The report makes no specific recommendations, since under the terms of reference none were requested. For this reason the report is made to speak for itself and the conclusions are a matter of obvious inference. For American mine managers, physicians, mine inspectors and others interested in the welfare of the mining population, the results of this investigation are of decidedly practical value and the method pursued in the inquiry would seem to be suitable for our own urgent needs to ascertain the actual conditions affecting life and health in metal mining with particular reference to the probable excessive occurrence of pulmonary disease. In order to obtain the required information the Commissioner personally visited the principal mining centers of Western Australia. Quite a number of witnesses were examined, including medical practitioners, officials of labor organizations, mine inspectors and others. No voluntary evidence was brought to the Commissioner's attention, which merely confirms the experience elsewhere that it is difficult indeed to arouse miners and other wage earners to a vivid realization of their own interest in matters pertaining to health and mortality. It requires to be considered, however, that personal opinion in a subject of this kind is of very limited value, and the excessive amount of verbal evidence often presented in government investigations frequently precludes the adequate consideration of the actual facts secured by scientific methods of inquiry.

The report of the Commissioner is divided into three sections: (1) Statistical, consisting of a study of the prevalence of lung disease among miners during the past ten years; (2) the results obtained in an examination of 2050 men engaged in the mining industry of Western Australia; of these 2050 men, 1805 were actually at work and were examined under conditions as nearly as possible identical with the actual conditions under which they carried on their work; (3) experimental. This last section describes the results obtained in a very limited number of experiments performed with the object of elucidating the pathological changes in the lungs of small animals produced by the continued inhalation of mineral dust.

Complete Data Difficult to Obtain

This outline of the scope of the investigation is admirable in its simplicity and comprehensiveness. Of all the information needed to establish the true incidence of health injurious trades probably the most conclusive is the actual physical condition of the workers obtained by a medical examination and a truthful record of personal sickness experienced with a due regard, of course, to the factors of age, race and nativity, mine experience and mine employment as followed in one or more localities or in different mining fields. The importance of strict attention to these facts was well brought out in the investigation into the health of Cornish miners and the present inquiry fully confirms this view. Of course many other facts must be taken into account, and chief among these are post-mortem examinations, but unfortunately it is often very difficult to obtain the lungs of deceased miners other than those killed by accident. The present investigation failed almost completely in this respect and the lungs of only one miner were available for the purpose, which, of course, precluded definite conclusions.

Importance of Adequate Data

A large amount of statistical data was collected for a period of 10 years and the conclusions from the facts obtained are briefly set forth as follows: (*a*) Lung diseases, in the 10 years under review, have been, considered as a group, distinctly more prevalent among miners than among males over 15 years of age generally; and while this is true of lung diseases considered as a group, it is also true for the principal individual diseases of this group. (*b*) An important factor in producing an excess for miners in the group of other respiratory diseases, has been fibrosis of the lungs. (*c*) At all ages between 25 and 60 the percentage of deaths from lung diseases in each age-group is higher among miners than among the general population. (*d*) Tuberculosis of the lungs has been steadily on the increase among miners during the period, and pneumonia has been steadily on the decline. (*e*) The miner has considerably less chance of surviving until the age of 60 years than has the average male over 15 years of age. (*f*) Considering the average ages at death for miners and for all males over 15 years of age, the miner has 3½ years less of life than the average male in the general population.

Merely as an economic question the foregoing conclusions derived from a sufficiently large statistical basis are entitled to serious consideration. Mine experience slowly acquired is of too high a degree of economic utility to permit of the needless waste of the miner's health, physical strength and years of life, but most of all in a country like Australia, where there is normally a deficient skilled labor supply. If the net economic gain of miners' work for a year is placed at $300, then the difference of 3½ years in the average age at death (granting the accuracy of this comparison) means a net economic loss to the mining industry of $1000 more or less of unrealized return on the human machine, which is, of course, the true productive force in every industry.

Tuberculosis and Fibrosis Defined

The difference in the duration of mine life is however probably greater than the 3½ years deficiency in the average at death. The difference is primarily if not exclusively the result of an excessive mortality from lung diseases, but in this connection it is pointed out in the report, and the conclusions will be read with decided interest by mine physicians, that "the term *miners' phthisis* is used in this paragraph for the first and last time in this report. That term is an inexact one, and its use has led to a great deal of confusion in the past. The term *phthisis* has for centuries been understood to mean tuberculosis of the lungs, which is a condition having its own distinctive pathological features;

but when abnormal conditions in the lungs of miners have been under discussion, the term *miners' phthisis* has been used with the intention of including indiscriminately both the fibrotic changes due to the tubercle bacillus. Such confusion of distinct pathological conditions should not be perpetuated; and therefore throughout this report, wherever the term *fibrosis* has been used it is to be clearly understood that the term includes only the changes produced by dust, and does not in any way refer to changes produced by the tubercle bacillus. Similarly, when the term *tuberculosis* is used it means tuberculosis, and does not include fibrosis.

It is not for a layman, of course, to take issue in a matter of this kind, but it may be said that the discussion has its practical application to the vexed question of industrial disease definition in all workmen's compensation laws. The time is probably not far distant when all industrial diseases, or in other words, diseases directly traceable to work exposure, will be brought within the scope of employers' liability and workmen's compensation legislation, and in any future consideration of the subject qualified medical opinion will be of the foremost importance.

Fibrosis More Prevalent among Machine Drillers

Cases occur, of course, in which both fibrosis and tuberculosis occur together, but it is said in the report that this is rare in Western Australia. A complete physical examination was made of 2050 men engaged in mine work, the men examined being divided into four groups: (*a*) Those actually at work and examined as nearly as possible under working conditions. (*b*) Those brought to notice by officials of various labor organizations; chiefly advanced cases who felt themselves unable to work by reason of affections of the lungs from which they suffered. (*c*) Miners examined at the sanatorium. (*d*) A few men who, for various reasons, desired to submit themselves for examination. Of the foregoing only the first group was considered a safe basis for final conclusions, being considered a "fair average mining population." The physical examination disclosed the following facts: (*a*) Early fibrosis was present among machine miners in the proportion of 33.16 per cent; among non-machine miners only 7.23 per cent.; among truckers 3.1 per cent.; and among dry treatment hands 24.5 per cent. (*b*) Intermediate fibrosis was found among machine miners and non-machine miners; late fibrosis was found only among machine miners. (It is unnecessary to specify the percentage of intermediate and late fibrosis respectively; the fact of their existence is of sufficient significance.) (*c*) Pleurisy was found to be present in men engaged in several different classes of mining. (*d*) Tuberculosis of the lungs was present in a total of 28 cases, *i.* e., 1.5 per cent., or, if the whole of the men examined (2050, including the selected cases) be considered, this condition was present in 65 cases, which is 3.2 per cent. (*e*) Early fibrosis was most commonly present among machine miners and dry treatment men. (*f*) Early fibrosis seems to make its appearance most frequently about the second year on machine work.

The Spread of Lung Disease Laid to Mining

Lung diseases, and particularly tuberculosis, being of rather rare occurrence in Western Australia the preceding facts and conclusions prove that these diseases are being spread through the mining industry, largely however by methods of mining more or less subject to improvement and company control. The Commissioner properly calls attention to the seriousness of the present situation and remarks: "This existence of a high percentage of fibrosis among working miners cannot be attributed to the importation of such cases from places outside Western Australia. This aspect has been dealt with, and it is quite clear that the mines of Western Australia can and do produce fibrosis to an important extent; for among machine miners fibrosis is present in 25 per cent. of the men, and among the dry treatment men in 19 per cent., these percentages are calculated for those men only who have never worked in mines elsewhere than in Western Australia. Fibrosis of the lungs has been shown in various ways in this report to be due to the action of dust; and as a general statement based on the results obtained by the experiments—and which may be taken as an indication of the lines upon which remedial measures must be instituted—it may be said that a man suffers from fibrosis to the extent to which he is exposed to the continued inhalation of the fine material, dust, in other words; if there be no dust there will be no fibrosis. The converse is equally true that the continued inhalation of dust certainly produces some fibrosis."

As a drastic measure toward the eradication of tuberculosis among miners, the exclusion of affected miners from the mines or mining communities is suggested, but also the segregation of tubercular persons, who are not themselves miners, but who come into more or less close association with them. In explanation of the point of view that tuberculosis of the lungs must be considered more in the light of an infectious than an industrial disease, it is said that: "The fact that tuberculosis is most common in men engaged on machine work has been interpreted as indicating primarily that this class of work, by reason of the close association of the two men working upon one machine, offers the greatest facility for personal infection. It has, however, been generally accepted that lung tissue which has been impaired by the action of dust is thereby rendered more susceptible to the action of tubercle bacilli. So far as I have been able to ascertain, there is no direct experimental evidence upon this point, but the fact that tuberculosis is found in all countries to be excessively prevalent among men engaged in other dusty occupations—for example, knife grinders, pottery makers, etc., must be accepted as indicating the correctness of this commonly accepted belief. Therefore, while tuberculosis among machine men is more an infectious than an industrial disease, it appears certain that the action of dust does predispose to the action of the tubercle bacillus. In this connection, the significance of the existence of a large number of cases of fibrosis must not be lost sight of."

Dust Predisposes to Lung Diseases

The importance of dust as a predisposing factor to lung diseases is recognized by all who have considered the subject. The report contains some very interesting observations upon the effect of dust on the lungs, or the changes in lung tissue produced by continuous dust inhalation, but these do not fall within the present discussion. It may be said, however, that the effect created by the presence within the lungs of dust is stated to be inflammatory changes throughout the lung substance, resulting in the production of fibrosis, and that the ultimate effects are, (1) diminished area of lung tissue available for the purification of the blood, (2) diminution in the amount of air which can reach the lungs, (3) diminution in the amount of blood which can reach the lungs.

The experimental and pathological evidence obtained by the Commissioner, therefore, seems to sustain the conclusion that: "Dust, and dust alone, is responsible for fibrosis; that the causation of pleurisy is somewhat obscure, but that here dust and cold both probably play some part; that there is not forthcoming any evidence to show that there are any other factors producing abnormal conditions in the lungs (except, of course, the tubercle bacillus) though the possibility of the rapid alterations of air pressure having some effect has been considered. It may be that these alterations of air pressure affect some in the direction of producing *emphysema*, but this is pure supposition."

High Mortality of Miners from Lung Diseases

The medical considerations aside, the statistical evidence presented in the report is entirely conclusive that lung diseases are extremely common among the miners of Western Australia. While of the mortality from all causes of all males over 15 years, 19.8 per cent. were from respiratory diseases, the corresponding proportion for miners was 53.9 per cent. Considering the mortality from diseases in detail, it is brought out in the report that the death rate from tuberculosis of the lungs was 9.6 per 10,000 for all males over 15 years of age, while the rate for miners was 19.2. From bronchitis the respective rates were 1.7 and 4.2; from pneumonia 6.7 and 22.7, from pleurisy 0.7 and 1.1, asthma and emphysema 0.5 and 1.3, and other respiratory diseases 0.5 for all males and 5.24 per 10,000 for miners. The foregoing rates prove conclusively that respiratory diseases, as a whole, are much more prevalent as causes of death among miners than among males over 15 years of age generally. Tuberculosis has steadily increased among miners from a rate of 10 per 10,000 in 1901 to 30 in 1909. There has been a decline in pneumonia, which may possibly be accounted for by more accurate medical diagnosis.

The death rates were not calculated by divisional periods of life, probably because the necessary information could not be secured. While calculations of the average age at death are apt to be misleading, it is, nevertheless, suggestive that the average age for all males, 15 and over, should have been 47.8 years against 44.2 for miners, a difference of 3½ years in favor of the general population. A comparative table is included in the report for Queensland and Western Australia, according to which the death rate from lung diseases among miners per 10,000 living was 50.03 in Queensland and 53.0 for Western Australia. The rates differ somewhat for the various forms of lung disease, but, on the whole, they confirm each other and sustain the view that the rates are at least approximately correct.

The Physical Examination of Miners

The most important portion of the report relates to the actual examination of working miners. Of the 2050 men examined all but 156 were gold miners actually at work, or at a sanatorium, or at union offices. There appears to have been no difficulty in making the physical examination, to which the men seem to have submitted without hesitation. It is stated that in 26 gold mines there were employed a total of 6846 men and of these 1805, or 20.5 per cent., were physically examined. Considered by individual employments, it is stated that 94 per cent. of the surface laborers were found normal, of the wet treatment hands 91 per cent., of the platmen 88.9 per cent., of non-machine miners 85.01 per cent., of truckers 82.9 per cent., of dry treatment hands 65.6 per cent., and of machine miners only 52.6 per cent. In other words, the surface laborers and wet treatment hands exhibited the best physical condition, while dry treatment hands and machine miners exhibited the worst.

Pleurisy, as more or less complicated by fibrosis, was found to exist among machine men to the extent of 44.9 per cent. of those examined; among dry treatment hands, 34.3 per cent.; among nonmachine men, 13.2 per cent., among wet treatment hands 8.3 per cent.; and among surface hands only 5.2 per cent. Early fibrosis was found among the men in the following order: Machine miners, 33.2 per cent.; dry treatment hands, 24.5 per cent.; nonmachine miners, 7.2 per cent., and truckers, 3.10 per cent. Intermediate fibrosis was only found among machine miners to the extent of 3.6 per cent. and among nonmachine miners to the extent of 1.6 per cent. Advanced fibrosis was met with only among machine miners, but to the extent of less than 1 per cent. Of course, men really seriously affected would not have been at work.

Each Trade Has Its Special Disease

Tuberculosis was found among machine miners to the extent of 2.2 per cent. and among nonmachine miners to the extent of 1.0 per cent. The conclusions are summarized as follows: "Machine men suffer from the three grades of fibrosis, from emphysema, pleurisy, and tuberculosis—the disease most prevalent among this class of workers is fibrosis. Nonmachine miners suffer from the first two grades of fibrosis, from emphysema, pleurisy, and tuberculosis. Truckers suffer only from early fibrosis and pleurisy, and considerably more from pleurisy than from fibrosis. Dry treatment hands suffer from early fibrosis, but not from the more advanced stages of the disease. There may be two reasons for the freedom from the advanced stages—the fact that they work in the open air, and therefore would not be likely to get so much dust in a given time as men working below on machines in a confined space; or, on the other hand, the explanation may be that men on the dry treatment plants have been working for a shorter period at that class of mining than the machine men, and are also much less exposed to rapid changes of temperature. Surface laborers were affected only with pleurisy, to the extent of one in twenty. Wet treatment hands were affected only with pleurisy, to the extent of 8 per cent."

While the present investigation is probably of greater interest to mine physicians than to mine managers, the following brief account of the main features of each of the stages of fibrosis will prove useful in diagnosing the disease in its early stages. It is said in the report that, "The early case is the man who finds that he is continually getting "colds," associated with cough, which he finds great difficulty in throwing off; he finds that his wind is not as good as it used to be, and that he cannot run so far nor work so hard as formerly, and in whom on examination the effort at expansion of the chest wall reveals a rigidity—a rigidity which has characteristics entirely its own, and which is not, so far as I am aware, seen in any other disease. At this early stage the man is apt to smile indulgently if it is suggested that there is anything wrong with his lungs, although he recognizes clearly that his wind is not so good as formerly and that he gets colds more often than he used to and cannot throw them off so easily."

Diagnosis of Fibrosis

"The next stage in the disease is marked by the fact that the intervals between the attacks of "cold on the chest" are less frequent and less lengthy—the bronchitis has become an established fact; the wind is now always short; occasional attacks of "asthma" occur, although hardly ever at night; expectoration is frequent, and a certain blueness of the lips and the face indicate that the heart is beginning to feel the strain, on examination the rigidity is more marked, roughening of the breath sounds confirm the hypothesis that the bronchitis has become established; emphysematous changes may be present, and the heart signs show the reason for the blueness of the lips and face. But the subject can still do an average day's work.

"When the subject finally has to cease work the advanced stage has been reached and then all the features above detailed are emphasized; the heart and lungs becoming progressively less able to carry out their functions."

In addition to the foregoing, it is pointed out that fibrosis makes its appearance, as a rule, about the second year of machine work. The cases of intermediate fibrosis were all discovered among men who had been engaged on machine mining for not longer than 16 years. With pleurisy the greatest incidence occurred before the fifteenth year after the commencement of machine work. Of the total of 424 normal men, 215, or more than half, had been working on machines for less than four years only, while 86 per cent. of them had not yet reached their tenth year of machine work. In explaining the causes responsible for the occurrence of fibrosis among machine miners, it is pointed out that dust is a common factor operating directly or indirectly in the production

of both fibrosis and pleurisy. The further conclusion is advanced that the mines of Western Australia can and do "produce fibrosis to a considerable extent, both among machine miners and dry treatment men; and it is to be expected that as the years go by there will be an increasing number of deaths from this cause and an increasing number of cases of fibrosis, if the conditions obtaining in the past remain unaltered in the future."

Dust Prevention Essential

Thus, in its final analysis, the problem of health in metal mining is largely a question of dust prevention. It hardly requires to be said that machine miners are practically rock drillers, working under almost identical conditions in the quartz mines of Western Australia, on the Rand, in the Cornwall, or in the western states of North America.

While not all of the conclusions arrived at by the Commissioner can be accepted as final, the report unquestionably constitutes one of the most valuable contributions to the literature of health in mining. The results of the physical examination of the men alone makes the inquiry a most important one and suggests the utility of a similar investigation in this country. It is certainly significant to find that out of 805 machine miners 267, or 33.2 per cent., were found to be affected with early fibrosis and 29, or 3.6 per cent., with intermediate fibrosis, and 4, or 0.5 per cent., with advanced fibrosis. Of the remainder of the machine miners, one was affected with emphysema, 62 with pleurisy, and 18 with tuberculosis. In other words, only 424 machine miners, or 52.6 per cent., were found to be in normal health.

Other Useful Data in the Report

The report contains a large amount of other interesting and valuable information, including the results of experimental and pathological investigations, a table of clinical standards, upon which lung affections are diagnosed and classified, a copy of the card used in the series of examinations among miners, a table of occupational classifications, extracts from the reports of the *Royal Commission on Miners' Phthisis in the Transvaal,* a report on *Miners' Phthisis at Bendigo,* and the report on the health of Cornish miners, also a chapter on the frequency of human infection in tuberculosis, and a brief, but suggestive, note on ankylostomiasis. The report is unquestionably a most useful contribution to the subject of miners' diseases and decidedly suggestive of the utility of a corresponding investigation into the health of American miners and men employed in ore-reduction works with a continuous and considerable exposure to the inhalation of health-injurious dust.

[*Fibrosis* is the development of a substance of fibrous texture in a tissue or organ, or a fibrous replacement of a tissue.

Emphysema is the permanent dilation of the passages into which the respiratory tubes enlarge, and of the elongated funnel-shaped sacs set with air cells which terminate the air passages of the lungs; the air cells becoming obliterated or ruptured.

Pleurisy is an inflammation of the membranes which line the walls of the chest and reflect over the surface of each lung.

Bronchitis is an inflammation of the bronchial membranes.

Pneumonia is an inflammation of the tissues of the lungs distinct from bronchitis and pleurisy.

Asthma is a paroxysmal disorder, the essential feature of which is the contraction of the bronchial tubes by the muscles in their walls.

Tuberculosis is a specific disease affecting most tissues of the body but especially those wherein there is a predilection to disorder, as the lymph glands and lungs, characterized by the presence in the diseased parts of the *tubercle bacillus.*

Phthisis is a disease of the lungs, characterized by the progressive consolidation of pulmonary tissue, with decay of the tissue and formation of cavities. Fibroid phthisis is a slow-going phthisis with considerable production of connective tissue. Both pulmonary tuberculosis and phthisis are commonly known as consumption and the last is differentiated by the usual presence of pyrogenic or fever-producing organisms as well as the bacilli.—Editor.]

Magnesium-Zinc Alloys

In a patent recently issued to Walter Rubel, of Berlin, Germany, for an alloy of magnesium and zinc, it is stated that "It is known that owing to the development of the airship, and of submarine and torpedo vessels, a brisk demand has arisen for a strong material of low specific gravity. In cases where lightness is of special importance, some constructors use aluminum. This material presents a number of defects, some of which are that in the lathe it cannot be worked without employing oil or soapy water and it likewise is less resistant to atmospheric influences than was heretofore thought.

It is claimed[1] by this inventor that an alloy of zinc and magnesium is a suitable material for airship construction. The use of a small quantity of zinc strengthens the magnesium, both for casting and for rolling into sheets. The use of the following mixture is advocated: Mg., 96 per cent.; Zn., 4 per cent.

[1] *Brass World,* Feb., 1911.

With every per cent. of zinc, the magnesium is greatly strengthened. It is unnecessary to use pure zinc, as the commercial article answers. The alloy may be made by first melting the magnesium in an iron crucible provided with a well fitting cover. When melted, the zinc is added and the whole stirred. The melting of the magnesium must take place with the exclusion of air. It is stated by the inventor that the fracture of the rolled alloy has a fine structure like that of steel. It can be rolled or cast and machined without difficulty.

Wages in the Iron Districts

Washington Correspondence

The U. S. Immigration Commission has completed a part of its report relating to the production of iron ore. In Minnesota 2000 employees and 218 families were studied. More than nine-tenths of the forces were immigrants, the chief races being in order of their numerical importance, Finns, Slovenians, Croatians and Italians.

Of the immigrant iron-ore workers on the Minnesota ranges only 7.0 per cent. had had any experience in mining before coming to the United States, while 75.0 per cent. had been farmers or farm laborers and unskilled laborers in their native countries. The average weekly earnings of native Americans were $16.20 and of immigrants $14.12. About four-fifths of all earned more than $12.50 each week. The average annual earnings of native Americans who were heads of families were $1024, and of foreign-born heads of families $659. The average annual income of American families was $1058, and of immigrant families, $995. More than one-half of both classes of families were entirely supported by the earnings of the husbands. About one-fifth of the American families, however, depended also upon the earnings of children and two-fifths of the immigrant families supplemented the earnings of the father by keeping boarders and lodgers.

In Michigan 3000 iron-ore workers were studied, the chief races employed being Finns, North Italians, Poles and Swedes. Again about 90 per cent. of the operatives were of foreign birth. The greater part of these immigrants had also been farmers or farm laborers abroad. Only about 10 per cent. had had experience in mining before coming to the United States. The average weekly earnings of immigrant employees were $14.24, of native American was $13.78.

In the South (Birmingham district) about 3500 employees were studied. Only 5 per cent. were foreigners, one-fourth were native American whites, while 67 per cent. were negroes. Native whites earned $11.09, the negroes $10.60 and the immigrants $8.81 per week.

Coal Mining Department

The Important News Of Coal Mining. New Appliances, New Methods, New Fields, Colliery Engineering

Safety Lamps and Firedamp

SPECIAL CORRESPONDENCE

At a meeting of the Manchester Geological and Mining Society in England, on Dec. 13, G. H. Winstanley, lecturer in mining at the Manchester University, read a paper entitled, "The Safety Lamp as an Instrument for the Detection and Estimation of Firedamp in Mines."

Mr. Winstanley expressed the view that the ordinary safety lamp, without elaboration of any kind, will continue to be the most popular and the most generally useful appliance, especially in the hands of the colliery fireman, for detecting the presence and estimating the amount of firedamp in the mine atmosphere. After considerable investigation and experiment, he is confirmed in that opinion, and also in the view that in the hands of a properly trained operator the safety lamp is capable, not only of detecting the presence of a relatively small percentage, but of affording reasonably accurate information with regard to the amount of gas present. He is also led to the conclusion that the whole question is one that is still far too little understood, even by those who might be expected to be fairly familiar with the subject.

The capacity of the safety lamp to detect and estimate gas depends, not upon the lamp, or entirely upon the kind of oil it burns, but upon the skill of the observer. The mere possession of a safety lamp does not endow the user with the power of detecting and estimating the presence of gas. In the hands of one man the lamp is merely a source of light; while in the hands of another, properly trained, it becomes a scientific instrument capable of giving fairly accurate results.

A Standard Size of Testing Flame

It has been suggested by some investigators, recognizing the fact that the size of the cap is seriously affected by the size of the testing-flame, that, in order to rely upon the size of the cap as an indication of the percentage, a standard size of testing flame must be adopted. In Mr. Winstanley's opinion it would be unreasonable to expect the ordinary colliery fireman, carrying on in the regular way his daily inspections, to adjust the size of his testing flame every time, accurately, to within one-hundredth of an inch above or below a standard light, or a total error of one-fiftieth of an inch. Yet a variation to this extent makes quite a considerable difference in the hight of the cap.

It may be asked, then, if the hight of the cap may not be relied upon to give an indication of the percentage, how may the safety-lamp flame be made use of as a means of estimating the amount of gas present? Mr. Winstanley secured some photographs taken with the same lamp in order to solve this question, and in the result arrives at the following conclusions:

(1) That the hight of the cap with a given lamp burning a given oil depends not only, nor principally, upon the percentage of gas present, but also upon the size of the testing flame.

(2) That even with a percentage so small as 1½ to 2, quite a large cap is produced with a testing flame having a small white apex, although these caps are very delicate and not easily seen.

(3) That the density of the cap (its visibility) is a more reliable indication of the percentage than the mere hight of the cap; and that, in order to estimate correctly the percentage of gas from the appearance of the cap, one must be familiar with all the variations in hight and degree of visibility possible with different percentages of gas and different sizes of testing flames.

(4) That with a percentage higher than 3, the growth of the cap, due to an increase in the size of the testing flame, is more rapid than with a percentage less than 3; and that, as the testing flame is enlarged, caps caused by 3 per cent., or less, rapidly become invisible, while with more than 3 per cent. the caps remain visible with a relatively large testing flame.

The Cause of a Coal-dust Explosion

Dealing with the necessity for care in testing for gas, Mr. Winstanley pointed out that the operation of testing for gas is one not unattended with danger. Indeed, he demonstrated by means of a simple experiment that a coal-dust explosion may be initiated by the operation of testing for gas, if by chance the lamp used should happen to be defective. "There is," he added, "a good deal of misplaced confidence in what are called safety lamps." Official returns show that there are in regular use in British colleries about 700,000 safety lamps. Of this number, however, more than half have only one gauze, which is almost equivalent to saying they are not safety lamps at all.

There is no "permitted list" of safety lamps, nor are they required to be put to the test, and the result is that one sees some dreadful imitations of safety lamps taken into mines, both faulty and inperfect in workmanship. And what of the undetected defects? Suppose all the lamps in use at the present time were called up and submitted to actual tests, how many would fail? Yet such lamps may be used for gas testing.

No matter how well ventilated a mine may be, it is common to find from time to time pot-holes and other cavities in the roof which are more or less screened from the air current and become lurking places for firedamp, which may appear to be fairly persistent and not too easily removed. What really happens in such a case is that as rapidly as the gas diffuses into the surrounding atmosphere, other gas is given off, which takes its place and thus tends to keep the cavity full. It is this circumstance which gives rise to the popular but erroneous impression that if undisturbed the light firedamp will ascend to the highest accessible place and remain there.

The fireman may have such a cavity under close observation, and as a matter of fact the amount of gas which it may contain may of itself be insignificant and quite incapable, regarded merely as a small body of explosive atmosphere, of producing serious consequence. In a dry and dusty mine, however, every circumstance directly or indirectly relating to ignition and combustion must be regarded as a possible source of disaster.

In conclusion, Mr. Winstanley urged, "the importance of the individual training of all firemen and other colliery officials whose duties require that they should be able not only to detect the presence, but also to estimate the amount of firedamp present in the atmosphere. They will be surprised themselves to discover how easy it is, after a little practice, to estimate correctly the percentage."

Statistics collected by the Pennsylvania State Department of Mines show that in 1909, the number of men employed in the bituminous mines of Pennsylvania totaled 185,921. The reports also indicate that the death rate, per thousand of employees, was 2.72. There were 272,661 tons of coal mined for each life lost.

Details of Colliery Trestles

By A. T. Shurick *

A discussion of the various types of construction common to the coal mines in America. Suggestions as to the style of bent that is best adapted to meet specified requirements.

*Engineer, coal properties, Amalgamated Copper Company, Washoe, Carbon county, Mont.

Probably no class of heavy timber construction is so replete with examples of poor design as the colliery trestles, of which the average coal mine tipple of today is the nucleus. The designing and proportioning of material is often left to a "practical" superintendent, graduated from the ranks of the miners, or it may devolve upon an otherwise thoroughly competent engineer, but one not familiar with the exigencies of the case. Again the trestles are at times designed by a machinery firm who are furnishing the mechanical equipment for the plant, in which event the structure is usually well proportioned to the requirements of the work; they, however, seldom specify any of the details, and their designs are usually drawn up by men entirely ignorant of local conditions which are, at times, of ultimate importance. In any event (and especially so on a tipple carrying considerable machinery such as shaking screens, conveyers, etc.), when running at full capacity, the vibrations of the structure will often cause one to look for an immediate collapse. This results in the introduction of additional bracing, usually a difficult and unsatisfactory procedure after the structure is completed, and it is no uncommon thing to see a tipple anchored by means of wire ropes.

Steel work for tipples has come into considerable prominence during the past few years, and when the probable life of the operation is great, this should be given due consideration. Since the maximum economy of operation is attained only with short hauls and large outputs, it is seldom that the economical life of the average mine exceeds from 10 to 15 years; a frame structure when well erected will, with some repairs, last this long and also have a final salvage value. Uncertainty as to continuity of the coal, especially among the more irregular Cretaceous measures of the Rocky Mountain province must also be considered before installing a permanent steel plant.

As the purpose of this article is to elucidate and discuss the approved methods of colliery construction from the standpoint of the active colliery engineer, a discussion of steel construction would be out of place and is omitted. While the engineer should have a good working knowledge of the resolution of forces in order to anticipate and provide for the different stresses liable to occur in any structure, theory as a whole is a negligible quantity in trestle designing and with a few of the more important exceptions, is entirely omitted. Where certain size material is designated as sufficiently strong to meet certain requirements, it is assumed that some one of the good construction timbers, adaptable for use in heavy construction, and common to all parts of the country, is available.

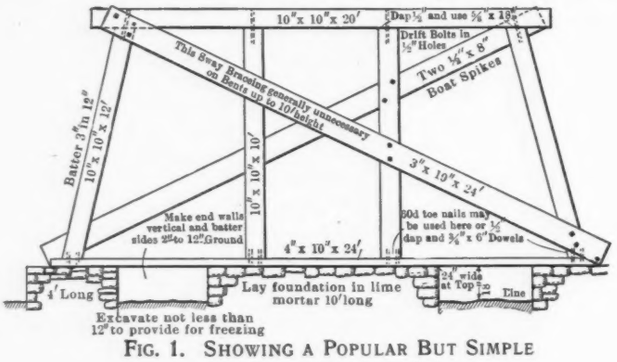

10"x 10"x 20'
Dap½" and use ⅝"x 18"
Drift Bolts in ½" Holes
Two ⅝"x 8" Boat Spikes
This Sway Bracing generally unnecessary on Bents up to 10' height
Batter 3" in 12"
10"x 10"x 12'
10"x 10"x 10'
3"x 10"x 24'
Make end walls vertical and batter sides 2¾ to 12" Ground
4"x 10"x 24'
20d toe nails may be used here or ½" dap and ¾"x 6" Dowels
4' Long
Lay foundation in lime mortar 10' long
24" wide at Top
Line
Excavate not less than 12" to provide for freezing

FIG. 1. SHOWING A POPULAR BUT SIMPLE AND RIGID TYPE OF BENT

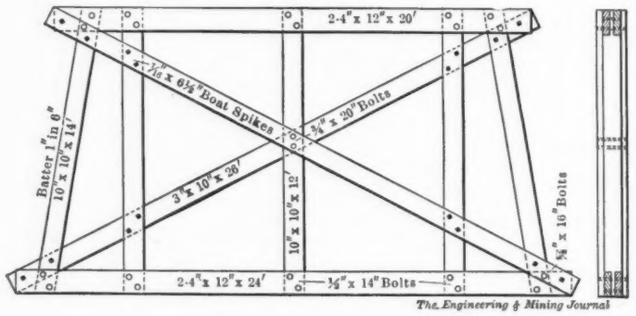


FIG. 2. METHOD OF FRAMING A STRONG SELF-CONTAINED FIVE-POST BENT

FOUNDATIONS

The kind of footing to be used will depend largely on the proposed life of the structure, and to a certain extent on the character of the ground. Poor foundation material in the coal formations is a rarity and piles or spread footings are seldom or never required.

When the probable life is short, from 4 to 6 years, and the ground comparatively firm and solid, it is customary to use a simple timber sill having a cross-section equal that of the posts of the bent. The ground is first leveled off and the sills placed in position and leveled up with short timber blocks or preferably with flat stones; the sills should never be permitted to rest directly on the ground for in this position they are liable to rapid decay. The topography of the ground is sometimes such as to make a continuous level sill impossible without excessive excavating. When such a contingency arises, the ground is leveled up in steps, and short sub-sills put down upon which rest plumb posts supporting the main sill. Should it be necessary to splice the sills, the simplest form of an ordinary lap splice should be used, care being taken to have the splice as far as convenient from any post.

When greater permanency is desired, it is necessary to resort to some form of masonry or concrete for the footings. The commonest form of foundation usually met with consists of a low, rubble masonry wall, from 18 to 24 in. wide, and extending the entire length of the sill. With a good quarrying stone and skillful labor, an 18 in. wall, battered 1:6 on both sides will sometimes be sufficient, but ordinarily a 20 in. wall with the same batter is used, while under some conditions a 24 in. wall is advisable. When the sill is very long, as is liable to be the case in a high tipple constructed with batter posts, there is a considerable waste of masonry when the wall is made continuous, and with no appreciable gain in strength. Thus with a four post bent only 10 ft. high, having a 20-ft. cap and a batter of 1:4, a saving of nearly one-third of the masonry will be effected by having one pier 10 ft. long under the center posts and one 4 ft. long under each of the outside posts.

These walls are built of rough rubble masonry laid in either lime or cement mortar; ordinarily lime will suffice, but in the presence of much moisture, or for bents carrying heavy machinery or otherwise liable to any considerable jar,

cement should be used. If the ground is only moderately damp, a mortar composed of 1 cement, 1 lime, and 3 sand may be used with good results, but for important work it is advisable to use a straight cement mortar composed of 1 cement to 3 sand. The wall should project from 6 to 12 in. beyond the end of the sill, and the best practice dictates the use of a 1:6 batter on the sides; for low walls this is often omitted, and is entirely unnecessary on the ends as the walls seldom fail there. In the colder climates, the ground should be excavated from 1 to 2 ft. to prevent the masonry from being heaved by hard freezing. Care should be taken to see that the stone is laid on its natural or quarry bed, the joints properly broken, and that a header or through stone occurs not less than every 4 ft. in length and 3 ft. in hight.

Overcoming Lateral Displacement

To provide against any lateral displacement of the sill, from three to five anchor bolts varying from ½ to ¾ in. in diameter are sometimes set in the masonry, thus giving a means for securing the sill rigidly in place. These bolts should be sufficiently long to pass through the sill and reach nearly to the bottom of the foundation except when for any reason the wall is excessively high, a projection into it of from 2 to 3 ft. being then sufficient. To secure the bolt in the wall the bottom end of it is threaded for a short distance and passed through a hole drilled in the web of a piece of rail and the nut attached; short pieces of from 16 to 30 lb. rail can be used for this, but a single long piece to which all the bolts in the pier may be attached is preferable.

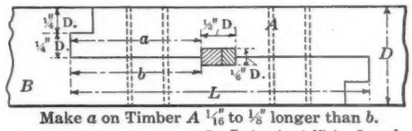
During the past few years concrete has come rapidly into favor as a material for footings, especially where greater permanency is desired. Owing to its much greater strength and reliability it is mostly used in the form of square piers instead of a continuous wall, thus effecting a considerable economy of material.

The size of these piers will of course vary with the size and importance of the structure they support, and the character of the foundation soil. For the ordinary tipple, they are commonly made 24 in. square with vertical sides, or 18 in. square at the top and the sides battered 1:6 or 1:4, eliminating the danger of the corners being broken. Usually a 1:3:5 concrete will suffice, but in the presence of any abnormal condition, a 1:2:4 mixture should be used. Where a large number of piers are being built, the forms, which are simply square boxes, may be used over repeatedly, and since the cost of forms, especially on small jobs, is an important item, a decided economy is thus effected.

Designs for Bents

The variety of designs for bents is almost innumerable, and the personal equation of the engineer enters largely into the selection of the one for any particular purpose. To the inexperienced on this class of construction the amount of vibration that will be developed on a high capacity tipple is a continual source of surprise, and experience has shown that every possible precaution should be taken to provide for this. One of the simplest and most effective methods of securing a tipple against lateral vibration is the use of batter posts in the bents, having a batter of from 1:4 to 1:12. While the plumb post is still used and recommended by some engineers, it is not generally considered in keeping with the best practice, and for this reason only the batter-post construction will be considered here. Thirty feet is usually taken as the maximum hight for any single bent, and when it becomes necessary to exceed this hight special designs are necessary.

In Fig. 1 is shown what is by far the most popular, and probably on the whole, the simplest and most rigid bent used. The ease of framing and erecting this type makes it especially adaptable for unskilful labor such as is often used on this work.



Make *a* on Timber *A* 1/16" to 1/8" longer than *b*.

The Engineering & Mining Journal

FIG. 3. A SIMPLE METHOD OF SPLICING MEMBERS UNDER COMPRESSION

With material of the dimensions shown, this bent is applicable for ordinary tipples from 30 to 40 ft. in hight, when the bents are placed 15 ft. on centers and capacity of the mine cars is 2.5 tons; when the tipple is equipped with shaking screens or carries any other abnormal load the posts should be increased to 12x12. The sill shown is amply sufficient when good foundations are used, but when the reverse obtains a sill of the same sectional area as the posts should be used. The sill should project at least 6 in. beyond the toe of the post, for the reception of which it is usually dapped ½ to ¾ of an inch, although in the case of the plumb posts this is entirely unnecessary.

In some cases a mortice and tenon joint is used here as well as on the cap, but this adds materially to the cost of labor and is liable to failure due to rotting. The best method of securing the posts to the sills is by means of dowels, and for the construction here shown two ⅝ in. by 6 in. round iron dowels, projecting 4 in. into the post and 2 in. in the sill should be used; with 12x12-in. sills and posts, ¾x8-in. dowels should be used. When using dowels, trouble is sometimes experienced in erecting the bents, due to the total absence of rigidity in the joint when not under compression, and for this reason it is customary to doubly secure the joint by toe-nailing with 60d nails.

The plumb posts should be set true and accurately, and the batter posts battered from 1:4 to 1:12; 1:4 being very common. When it becomes necessary to splice the posts, as often happens, the form shown in Fig. 3 is one of the best and simplest methods of splicing members under compression. The length *L* for hard woods such as ash, oak or hard pine should be 2 or 2.5 times the depth *D*, while for soft woods *L* should be equal to 4 *D*. The bolts will vary from 4½ in. for 6x6 timbers to 8⅞ in. for 12x12, and should be given a driving fit. The keys should be of hard wood, tapered, and driven in from both sides; the difference of ⅛ to 1/16 in. in the dimensions *a* and *b* insures a neat snug fit when the cuts are true and accurate.

With a mine using a moderately large car of say 2.5 tons capacity, and with the usual double track tipple, the cap should be 20 ft. long to insure plenty of room for dumping and handling cars. The cap should be dapped ½ or ¾ in. for all posts, the batter posts are set from 9 to 16 in. from the ends and for the construction here shown, each post should be secured with a ⅝x18 in. round iron drift bolt, well pointed and driven in a ½ in. hole. With 12x12 posts and caps a ¾x20 in. drift pin should be used.

Another Method of Framing

Fig. 2 shows a method for framing a very strong, rigid and self-contained five post bent, which is adapted equally well for a two, three, or four post bent. The framing of this bent will require more labor than for Fig. 1, although not necessarily a better class, and when the material runs close to dimensions (as to width and thickness) the result is usually a very neat and satisfactory job.

Owing to the introduction of the fifth post (which may be omitted when interfering with the chutes and screens) and the strong rigid method of securing the joints, this construction may be safely used under the same conditions noted for Fig. 1 and for hights up to 60 or 65 ft. The method of securing the joints at the sill makes this construction especially adaptable for concrete piers, one of which should be located under each post. The sill timbers should project not less than 8 in. beyond the posts and the bottom of the tenoned portion of the post should be left ½ or ¾ in. above the bottom of the sill to provide against any pressure being brought on the tenon. The entire load on the posts should come on the sills, the tenon being designed merely to secure the

post against any lateral movement, and care should be taken with these tenon cuts to insure a true, even bearing for the posts. All joints are secured with two ½ in. through bolts, and other details as to length of cap, batter of posts, etc., are the same as mentioned for Fig. 1.

Fig. 4 shows a modified form of Fig. 1 and one adapted essentially for a trestle bent, rather than for use in a tipple. The distinctive feature of this form is the use of a light batter post, which is introduced to secure additional rigidity, and as an aid to the method of bracing employed. The safety of a design of this form is largely dependent on securing good joints at both ends of all posts, hence both cap and sill should be dapped for the posts and care taken to see that the framing is neat and accurate. The general details as to drift-pins, dowels, etc., are the same as for Fig. 1, with which it will compare favorably as to simplicity of design and ease of erection. This type is attaining considerable popularity, but

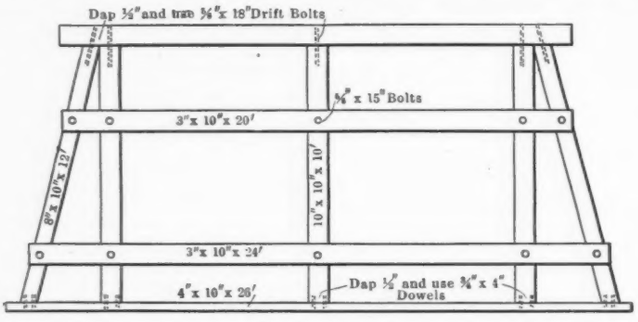


FIG. 4. MODIFIED FORM OF BENT SHOWN IN FIG. 1, AND BEST ADAPTED FOR A TRESTLE

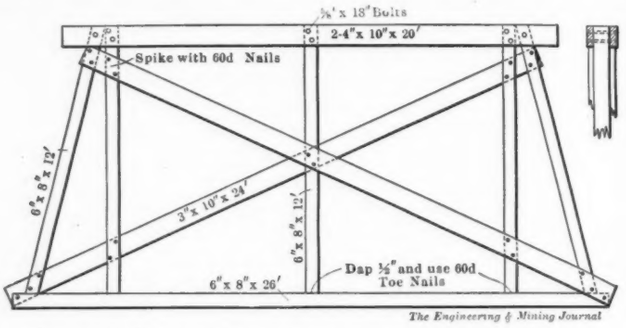

⅝" x 18" Bolts
2-4" x 10" x 20'
Spike with 60d Nails
6" x 8" x 12'
3" x 10" x 24'
6" x 8" x 12'
6" x 8" x 26'
Dap ½" and use 60d Toe Nails
The Engineering & Mining Journal

FIG. 5. A STYLE OF BENT BUILT OF LIGHT MATERIAL AND ADAPTED FOR ORDINARY TIPPLES

aside from a small economy of material in the method of bracing, it has nothing in particular to recommend it, and should never be used under trying conditions.

A TYPE OF BENT FOR ORDINARY TIPPLES

In Fig. 5 is shown another form very similar to Fig. 4, but of much lighter material and with a different arrangement for the cap. This bent is adaptable for ordinary tipples 30 or 35 ft. high when cars of 1.5 or 2 tons capacity are used, and the bents spaced 16 ft. on centers. The feature of this design is the arrangement of the cap, which is simple and requires little or no framing when the material runs well to prescribed dimensions. The particular advantage of this cap lies in securing a broader bearing for the girders which, with cap material of small dimensions is a decided advantage and especially so when the bents are laid on a curve.

Since the projection of the cap does not make it possible to secure an effective joint of this with the sway-bracing, a weakness in the design appears at this point, which is offset in a measure by the rigidity of the cap and post joint. The sill should be dapped for the posts, and particularly for the batter posts, and the latter secured with two 5/8x5 in. round iron dowels, while the plumb posts may be toe-nailed with 60d nails. The posts are notched for the caps only enough to secure a neat, snug fit, and the plumb posts are secured to the cap with two ⅝x18 in. through bolts, only one being used for the batter posts.

Composite framing is meeting with considerable favor for use on tipple construction, and Fig. 6 shows an example of this style. The principal advantage of composite framing, as is well known, lies in the ease of securing a strong, rigid splice, the susceptibility of the smaller size material to more thorough inspection, and less probability of containing rotten centers, shakes, etc., which are not perceptible in timber of larger dimensions. On the other hand the labor and iron account will run higher with this method, and a skillful class of labor is essential to insure good results. While this method of framing has been adopted by some of the larger companies as their standard method of construction, it is principally adapted to conditions where the reliability of the structure is of ultimate importance, or the ease and facility of making repairs is an important consideration.

RADICAL DIFFERENCE IS BUILT-UP POST

With respect to the caps, sills, batter and number of posts, this type is essentially a reproduction of Fig. 1, the only radical difference being the use of the built-up post. The posts here illustrated are made with two 4x10 in. pieces, giving a total cross-section equal to a single 8x10, or 80 per cent. of a 10x10. Since to secure absolute reliability of construction, it would be necessary when using a solid 10x10, to allow an excessive factor of safety to provide for any imperfections in material, the final working value of the 10x10 will not greatly exceed that of the two 4x10 pieces.

When using a solid post there is always the possibility of the timber warping to such an extent as to make the joints of the sills or caps with the posts dangerous and exceedingly difficult to secure; in composite construction, where the grain of the two pieces are laid opposite, this seldom happens. In the construction here shown the pieces are separated 2 in., packing blocks of 2x10 in. plank being used at the ends to provide for the dowels and drift-pins and 2-in. cast-iron separators at intermediate points, not to exceed 5 ft. apart. When splicing becomes necessary, this is easily done by introducing a packing block from 3 to 6 ft. long and securing with from four to eight ⅜ or ½-in. bolts, care being taken to see that the butt joints have a true, even bearing. With batter posts, or others carrying excessive loads, the two members of the post should be spliced at different points, which provides one solid piece at each splice.

The engineer is sometimes limited as to the size material he can use, it being advisable for some reason, such as the excessive cost of large dimension stuff, or the wish to use up some lighter material on hand, to use composite construction throughout. Fig. 7 illustrates an exceedingly strong and durable example of this class of construction, and one in which repairs and renewals are easily made. The posts are essentially the same as shown in Fig. 6, but of somewhat heavier material and turned at right angles in order to secure a better joint with the cap and sill. These latter are both made of the same material as the posts and joined to them by an extension of the packing blocks, all being secured and drawn up tight with ⅝-in. bolts, as shown. It is not usual to dapp either the sills or caps for the post timbers, although this may be done for the batter posts, but the joints should be made true and even to insure against any compressive stress being thrown on the packing blocks, which are of lighter material and would be easily ruptured.

This construction is, in many respects, similar to Fig. 6 and much that has been said for it will apply equally well here. The chief point of difference lies in the joint of the posts with the cap and sill, the one here shown being generally con-

sidered the best and most rigid joint attainable, and one that is particularly adaptable to the broken floor arrangement made necessary by the different elevations of the loaded and empty tracks.

Sway-bracing

Sway-bracing is a point often seriously neglected and one requiring good judgment and careful attention on the part of the engineer. Tipples are sometimes built of excessively large timbers, and yet so lacking in proper bracing as to swing and vibrate in a most alarming manner when working full capacity.

While it is impossible to lay down any set rules to govern the amount of bracing necessary, generally speaking all tipple bents and all trestle bents exceeding 10 ft. in hight, should be braced with the single cross bracing, as shown in Figs. 1, 2, 5, 6 and 7; for bents 20 to 40 ft. in hight, two cross braces, separated by horizontal braces, should be used. Fig. 4 shows a style of bracing adaptable to less trying conditions than the cross bracing, and where it is desirable to effect economy of material; the effectiveness of this bracing is largely dependent on making a good firm joint of the posts with the caps and sills. The cross braces, when of sufficient length, should extend to the extreme ends of the caps and sills, and while most drawings show them neatly trimmed to fit around the caps and sills at the ends, this only adds to the cost, may decrease the strength, and is entirely unnecessary when the corners do not interfere.

With 6x6-in. and sometimes 8x8-in. posts, 2x8 or 2x10-in. braces, fastened with 60d nails, are sufficient, and with 8x8 or 10x10-in. posts, 3x10-in braces, fastened with ½x8-in. boat spikes or ⅝-in. through bolts, should be used; boat spikes are cheaper, but more detrimental to salvage, and less satisfactory when making repairs. With 12x12-in. posts, 3x10 or 4x10-in. braces are used, fastened with ½x8-in. boat spikes or ¾-in. through bolts, given a driving fit; the 4x10 in. is used only for trying conditions. When using boat spikes they should be driven with the edge of the point approximately perpendicular to the direction of the grain of the timber in the post, the efficiency being nearly 25 per cent. greater than when driven with the edge parallel.

It often happens the diagonals of a bent are too long to be reached with a single length of plank, in which event it is customary to bring the braces in at the bottom. If the bent is to be subjected to heavy or eccentric loading, it is advisable to divide it into two units, and single cross-brace each unit.

Spraying Coal Dust with Soap and Water

Special Correspondence

In connection with the last meeting of the North of England branch of the Association of Mining Electrical Engineers, an interesting demonstration was made by Doctor Thornton, the professor of electric engineering at Armstrong College, Newcastle-on-Tyne. Mining men all over the world are concerned about the problem of coal dust and reducing its explosive qualities. In ordinary watering there is an absence of binding effect upon the dust, and when the moisture has dried up, the dust returns again to its powdery state. Calcium chloride possesses some advantages, but it is objected to on the ground that it converts the wetted substance into an unpleasant, sticky mixture. Then again mixing considerable quantities of stone dust with coal dust has been tried, the stone dust having a dampening effect upon the fire.

These dust-laying processes have been duly considered by Doctor Thornton, who has made experiments favoring the view that an efficacious spraying mixture can be made with soap and water. Such a mixture, if the results of a practical trial equal the purely experimental effects, will insure excellent binding properties. He demonstrated that the whole question of the wetting of dust was one of surface tension of the liquid used, and that the water alone did not possess the property of readily wetting the coal dust, unless indeed it was used in large quantities. On the other hand, the soap and water mixture completely wetted the dust, turning it into a liquified form of mud, the chief component of which was coal dust. The experiments favored the conclusion that, whereas with water alone, 10 times the weight, in proportion to the amount of dust, is necessary to wet the dust, with the soap solution a much less quantity will be required.

Effect of Spraying Dust with a Soap Solution

In the event of this conclusion being substantiated in daily mining practice, the knowledge of so simple a remedy will be of inestimable value to the mining community. Professor Thornton further demonstrated that coal dust which has been sprayed with water and then reduced can be easily blown into the air, but coal dust which has been sprayed with the soap solution dries in a form more closely resembling a distemper than anything else, and this cannot be blown into the air. The demonstration shows that it can be loosened from the surface upon which it was placed, but this could only be accomplished by rubbing it with the fingers.

Professor Thornton carried on his experiments in small glass dishes, the quantities of coal dust used being in excess of the quantities found on a proportionate surface in the mine. The consequence is that it can be more readily loosened with the fingers than would be the case with a thinner layer, such as would be met with in practice. The professor's experiments seem to demonstrate that the coal dust will receive a thorough wetting if a percentage of soap is mixed with the spraying water; also that in the calamitous occurrence of an explosion, even though it may become dry, it will still adhere to the surfaces upon which it has become deposited, and for that reason will not become food for the fire. This is an interesting conclusion, and if theory and practice agree, there will be less likelihood of the explosion spreading through the workings because of the presence of coal dust in the air.

It was pointed out by Professor Thornton that the quantity of soap necessary for the purpose is not great, so far at least as his experiments indicated. Furthermore, any kind of soap can be used.

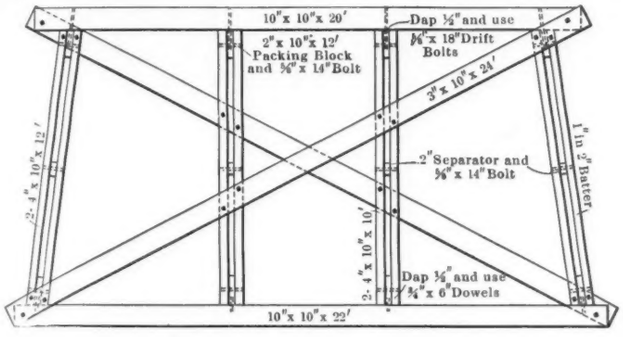

10"x 10"x 20'
Dap ½" and use
⅝"x 18" Drift Bolts
2"x 10"x 12' Packing Block and ⅝"x 14" Bolt
3"x 10"x 24'
2-4"x 10"x 12'
2" Separator and ⅝"x 14" Bolt
1" in 2" Batter
2-4"x 10"x 10'
Dap ½" and use ¾"x 6" Dowels
10"x 10"x 22'

Fig. 6. Showing a Type of Composite Framing Largely Used in Tipple Construction

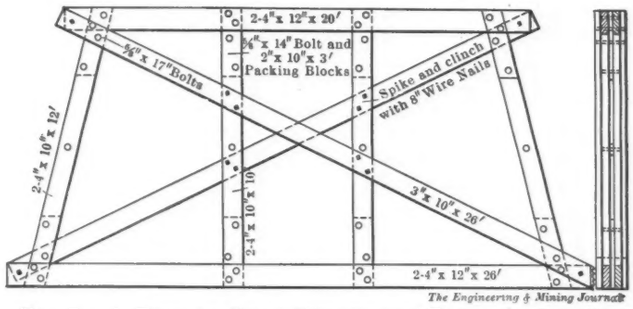

2-4"x 12"x 20'
⅝"x 14" Bolt and 2"x 10"x 3' Packing Blocks
⅝"x 17" Bolts
Spike and clinch with 8" Wire Nails
2-4"x 10"x 12'
3"x 10"x 26'
2-4"x 10"x 10'
2-4"x 12"x 26'
The Engineering & Mining Journal

Fig. 7. A Type of Bent Where the Engineer Can Use Up Light Material in a Composite Construction

A New Metallizing Process

By A. Gradenwitz*

In connection with all the metal-plating processes so far used on an industrial scale, especially those of an electrolytic or galvanic nature, the surface to be treated has at first to be made electrically conductive. Another inconvenience of these processes is the necessity of introducing the objects to be treated into an electrolytic bath, which necessarily limits the dimensions accessible to the treatment, while excluding in most cases any possibility of using a portable apparatus. Nor should the fact that not all metals are capable of galvanic precipitation be left out of account.

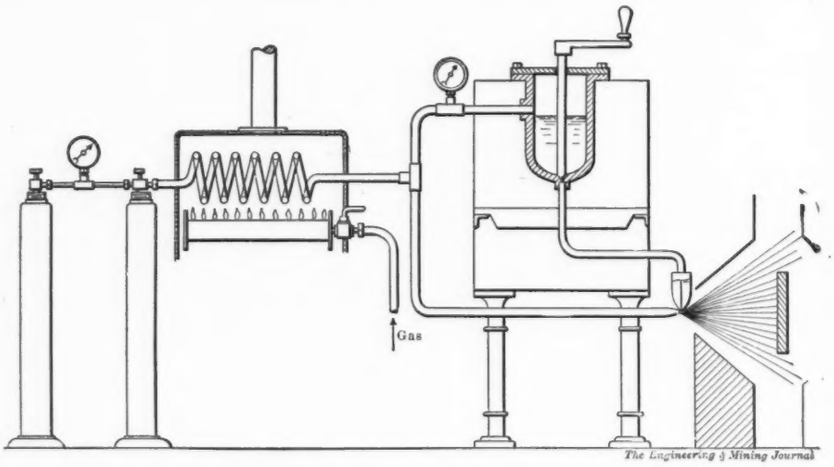
Electric Current Not Used

The metallizing process invented by M. U. Schoop, of Zurich, is independent of any electric current or electrolytic bath, and is distinctly different from any process so far known. It mainly consists of throwing finely distributed liquid metal with great energy against the surface to be metallized, thus forming homogeneous coatings which are remarkable for their beautiful, smooth appearance as well as their cheapness. The fine distribution of the liquid metal is effected either by means of gases or vapors submitted to high pressure or by purely mechanical means (centrifugal apparatus, nozzles, etc.), the essential point being that the liquid metal is suddenly converted into a metal cloud through which the objects to be metallized are conveyed at high speed.

When gas under high pressure is used the liquid metal comes out in the form of a thread a few millimeters in thickness, which, shortly after leaving the nozzle, is torn asunder and pulverized by a jet of (possibly heated) high-pressure gas. The speed of the metal particles thus thrown against the surface, in the case of a working pressure of about 20 atmospheres, is as high as about 25 km. per hour. As the metal particles, far from being solidified, are still in a plastic condition, they are welded by the impact so as to form a perfectly homogeneous metal layer. The gas pressure obviously is varied according to the fluidity of the metal, but its chemical and physical properties, as well as the required thickness of layers, the surface of the object to be treated, the form and operation of the pulverizing apparatus, etc., should likewise be taken into account. Experiments continued for years have allowed a number of suitable methods to be found by purely empirical means.

As explained in a lecture recently delivered by Schoop before the Zurich Association of Engineers and Architects, liquid metal of a temperature of many hundreds of degrees has thus been found to be cooled down to 60 deg. C. and less, when pulverized by superheated dry hydrogen, or superheated nitrogen at 20 to 30 atmospheres pressure, so that even combustible and easily melting substances, such as paper, celluloid, tissues, wood, etc., can be metallized, while fruit, flowers and anatomical parts can as well be coated with metal layer. For producing metal layers of especial density, and without any oxides, there are used chemically inactive gases or vapors free from any oxidizing components. The metal layers thus produced will form either adhesive coatings, used for protecting or embellishing the object under treatment, or self-contained metal bodies capable of being removed from their support or matrix.

To the first class of products belong: Parabolic mirrors and electrically conductive surfaces, metallized wooden objects (propellers, poles, etc.), rust-proof coatings for iron and steel, metal coatings for textile tissues or for the interior surface of pneumatic tires, all kinds of art products, substitutes for the metal capsules so far used for closing bottles, coatings for barrels, adhesive aluminum coatings for zinc, tin, lead and other metals, or conversely the coating of aluminum with any metals, metal papers, metal foils, metallized paper hangings, etc.



Apparatus for Producing Metal Coating

A Substitute for Soldering and Welding

The second class of products comprises printing *clichés*, stereotyping plates, matrices, substitutes for all kinds of galvanical reproductions, hollow objects, seamless tubes, etc. This process also enables two metal pieces to be connected as if soldered or welded, the two portions to be united (which may be of different materials), being heated conveniently and submitted to metallization. Two lead pieces can, for instances, be readily connected together by metallization with finely distributed lead, without using any intense flame. There are few inventions which admit of so many applications as the process above described. The following possibilities are chosen at random:

Metal coatings on the Schoop system will afford an excellent means of preserving wood, which is likely to be of special value in connection with the timbering in moist mines. The coatings also remove to a high degree the fire risk of wood. Again, in the case of airships, the metallizing of wooden propellers will be especially appreciated, because the smooth metallic surface obtained will reduce the frictional resistance opposed to air, and vibration during operation, while increasing the life. The same process is excellently adapted for the closing up of glass bottles containing costly or sensitive liquids, and also enables electric condensers and fuses to be readily manufactured with paper or pasteboard. The outlook for the production of art objects is especially promising.

Apparatus Portable

Being made portable, the metallizing apparatus can be taken to the spot in order to provide bridges, cranes and other constructions, with a protective metal coating, thus avoiding the expensive, though little durable, oil painting. In a similar manner the hulls of vessels can be coated more easily and cheaply than heretofore. As the new process enables a metallic copy of an original to be obtained within a fraction of a minute, it will prove a powerful competitor to galvano-plastics, especially in connection with the production of stereotype plates and *clichés*. All the industries concerned with the production of metallic coatings and hollow objects will derive much profit from the new process, and the preserving of fruit, eggs and other articles of food will find therein a means of producing an absolutely air-tight closure. Finally, the new process will allow anatomical preparations to be made durable.

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January Operations of Goldfield Consolidated

During January a greater tonnage of ore was milled by the Goldfield Consolidated Mines Company than during December; the gold content was slightly higher, but the extraction was lower by 1.12 per cent. The gross recovery was $51,416 more than for the previous month.

Milling Operations

The total ore milled in January was 27,192 tons, of an average value of $29.35. The total value of the ore milled was $798,177; the extraction $27.32 per ton; the net profit $552,627, or $20.03 per ton.

JANUARY OPERATING COSTS AT GOLDFIELD CONSOLIDATED.

		Per ton of ore.
Mining:		
Development	1.07	
Stoping	2.29	
		3.36
Transportation		0.10
Milling		2.48
Marketing		0.18
General expense		0.70
Bullion tax		0.30
Construction		0.17
Total cost per ton of ore		$7.29

Development Work

The report of General Superintendent J. F. Thorn on the development in the various mines follows:

Combination—No new discoveries have been made in this mine, but the extending of the known orebodies is being continued and the mine is at least holding its own.

Mohawk—The condition of this mine greatly improved during the past month. The discovery on the 350-ft. level produced 1255 tons of ore worth (according to mine samples) $117,970. A sill floor has been cut nearly 40 ft. square on this orebody, and it has every indication of permanency. On the 450-ft. level, almost vertically between the 403 stope on the 333 level of the Red Top and the 603 stope on the 600-ft. level of the Clermont, a large sill floor has been cut that has produced 3187 tons of $20 ore, and two drifts (new work) branching from this stope, one going north and one south, have produced 654 tons of ore; the south drift producing 319 tons, worth about $18,000 and the north drift producing 335 tons worth about $3500. Up in the old Sheets-Ish workings a virgin piece of ground has been discovered that has produced 200 tons of ore worth about $6000. The indications are that this territory will produce several thousand tons of $20 to $30 ore.

Clermont—The only development of any importance in this mine is on the 900-ft. level where the upward extension of the ore discovered on the 1000-ft. level last November, probably has been found. This also seems to be the downward extension of the 407 orebody on the 600-ft. level of the Mohawk. The map shows these orebodies to be nearly in line, and the indications are that eventually a large quantity of ore from this section will be mined. The incline distance between these orebodies has been marked on the map which, when added together make a distance of approximately 700 ft. on the incline of the vein in virgin ground. Of course, it is not certain that these orebodies will connect, but the indications are that they will, and it is also expected that in the downward extension in the workings from the 1180-ft. level of the Grizzly Bear, they will also be found.

Red Top—The only new work of any consequence was two drifts north and south from the bottom of a winze in the Vinegerone ground. These drifts produced 360 tons of ore worth about $9000. This same orebody was cut in the north end of the 600-ft. level on the Laguna, from which point a raise has been started, the incline distance on the vein between the two points being 312 feet.

The mines as a whole are looking well. The famous 401 stope on the 750 level of the Clermont has produced for 19 days of this month, according to mine assays, $337,000, and as far as can be seen, shows no signs of weakness. A net profit for the month of February of $650,000, is expected. During the month there was purchased from the Red Top Extension Company, for the sum of $13,000, a small piece of ground (about 1½ acres) known as the Bulldog Fraction. The vein in this fraction undoubtedly apexes on the Red Top, but to demonstrate this fact would probably have cost the company $20,000, and as there will be quite a tonnage of $20 ore mined from the property, it was thought best to buy it.

Water for Miami Mills

Globe Correspondence

About a mile east of Pinto creek, Arizona, near the Miami-Cactus wagon road, two drill holes have been sunk that encountered a flow of underground water in the Gila conglomerate at a depth of 160 ft. The drilling was done by the Cactus company in quest of ore on claims held under option. One of the holes, which overflowed for a time after striking water, was started May 18, 1910. It is not more than three or four miles from the concentrator of the Miami Copper Company, and 600 ft. higher. At present there is no artesian flow. Other holes have been bored in Pinto creek, revealing an abundant underground flow of water.

Pinto creek is five miles from the Miami concentrator and so low that the water would have to be pumped over a low summit, one and a half miles away. One of the creek holes was bored to a depth of 705 ft.; it contains 500 ft. of water. Another, drilled a mile farther west was sunk 759 ft. and was filled by water.

A hole was bored in the dacite and no water found until the underlying schist was cut, when a heavy flow of clear water was encountered. Though the amount of water available is not stated it is confidently expected that sufficient supply can be obtained for all mill requirements.

Porcupine Developments

A careful estimate of ore reserves in the Dome and the Hollinger mines, at Porcupine, says the *Boston News Bureau*, gives the Dome $7,000,000 definitely blocked out and ready for the mill, and Hollinger $3,000,000. This, however, does not include indicated ore. The Dome has an orebody 600 ft. long by 350 ft. wide at the 40-ft. level. All this is milling ore of an average value of $10. Diamond-drill cores at the 400-ft. level showed no change in the formation. All mill machinery will be in before the breaking up of winter and excavations are well advanced. The ore is ideal for milling purposes, about 50 per cent. being free milling. As mining will be inexpensive, total cost of production should not be more than $2.50 per ton.

The Hollinger has a high-grade vein of quartz, averaging 8 ft., developed now for 1300 ft. at the 100-ft. level. The official statement of value of ore is $49, but a conservative estimate would be $37. The winze at the 200-ft. level shows that the vein is continuous in value and width. The custom mill at which the Hollinger ore has precedence will be ready about July. About 95 per cent. of the Hollinger ore is free milling, and for the present ore will be treated by concentration and amalgamation alone.

The Bewick, Moreing & Co. interests, which took up 45 of the Timmins, McMartin and Dunlap claims, have established two camps, one in southern and the other in northern Tisdale. All the properties are entirely undeveloped. Compressor plants are now on the road into camp and 150 tons of equipment will be rushed in.

Anaconda Smoke Decision

A despatch of March 7 says that the U. S. Circuit Court of Appeals of San Francisco has decided the smeltery smoke case in favor of the Anaconda company and against the farmers who sought to close the big Washoe smeltery. The decision affirms that of Judge Hunt, of the Federal court, in Montana, given a year ago and practically ends the long anxious litigation, although the farmers may appeal to the Supreme Court at Washington.

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

C. W. Merrill, of San Francisco, is in New York.

H. C. Hoover arrived at New York from London this week.

B. F. Fackenthal, Jr., president of the Thomas Iron Company, is in California.

Mark R. Lamb has returned to Milwaukee from a long trip in South America.

Richard A. Parker has moved his office as consulting mining engineer to 929 Foster building, Denver.

Edgar S. Cook, president of the Warwick Iron and Steel Company, has gone to Europe to remain several months.

H. C. Anchor, formerly of California, has been engaged to take charge of the work on the Dome Extension, Porcupine, Ontario.

J W. Bryant is now in charge of the Cornell gold-copper mine, near Van Anda, Texada island, B. C., for the Tyee Copper Company.

Theodore Dwight, of New York, has become associated actively with the Catlin & Powell Company, brokers, with offices at 15 Broad street, New York.

Percival Roberts, Jr., of Philadelphia, has been elected a member of the finance committee of the United States Steel Corporation, in place of W. E. Corey.

F. H. Probert left Los Angeles for Butte, Mont., March 1, to be gone two weeks. While there he will make an examination of the Butte-Superior property.

Thomas C. Clarke, formerly general superintendent of the Lackawanna Iron and Steel Company, is now at Bethlehem, Penn., with the Lehigh Coke Company.

William J. Uren, general manager of the Osceola, Tamarack, Ahmeek, Seneca and Isle Royale copper mines, has tendered his resignation and it has been accepted.

Walter R. Hensey, of New York, recently returned from an inspection of the Elk Lake and Gowganda districts, in Ontario, in which he is extensively interested.

James McNaughton, general manager of the Calumet & Hecla and subsidiary companies, is in Boston on business connected with the proposed merger of the companies.

W. A. Overall, of Franklin, has been selected by State Inspector George E. Sylvester as district inspector for middle Tennessee. He will take the place now occupied by J. Walter Allen.

F. J. Longworth is now superintendent of the British Columbia Copper Company's Napoleon mine, near Boyds, Wash., having succeeded Mr. Galt, who several weeks ago left for Nevada.

F. W. Guernsey, for years with the Consolidated Mining and Smelting Company of Canada, Ltd., at Trail, B. C., has been appointed manager of the Bankhead colliery, Alberta, under Lewis Stockett.

Howard W. DuBois, of Philadelphia, recently spent several days in Victoria, B. C., before going up to the Cariboo district, where he is putting in an extensive water-supply system for gravel-washing for the Quesnelle Hydraulic Gold Mining Company.

The valedictory banquet given on Feb. 20, at Trail, B. C., to W. H. Aldridge, who on Jan. 1 retired from the position of managing director of the Consolidated Mining and Smelting Company of Canada, Ltd., was a striking tribute to the general esteem in which he is held in British Columbia. Mr. Aldridge's friends presented him with an address, and the employees of the company gave him a service of silver plate, manufactured from silver mined in the Kootenay and refined at Trail.

OBITUARY

George S. Ramsey died at St. Mary's, Penn., Feb. 21, aged 54 years. He was born in Scotland, but came to this country when a child. He began work as a coal miner at an early age, and soon rose to be mine foreman and manager. He had held responsible positions in Pennsylvania, West Virginia, Colorado, Wyoming and British Columbia. For 15 years past he had been general manager of the mines of the Shawmut Coal Company.

Dr. Charles Tenison Deane, president of the board of trustees of the California State Mining Bureau, died in San Francisco, Feb. 24. He was 70 years old, a native of New York and had been for many years a resident of San Francisco. Doctor Deane retired from the active practice of medicine several years ago, and was identified with the petroleum industry in the early years of its progressive history, being secretary of the California Petroleum Miners Association from 1901 to 1905. He was appointed a trustee of the State Mining Bureau in January, 1908, by Governor Gillett, and elected vice-president. He was elected president of the board in July, 1910. He leaves two sons.

Aaron H. Kelly, of Nelson, B. C., died at Victoria, Feb. 15. He left Nelson in January, intending to pay a visit to California, but proceeded first to Victoria, where he had an operation performed. He rallied after the operation, but suffered a relapse. Mr. Kelly was 64 years of age. He was born at Fredericton Junction, N. B., and after leaving school engaged in business there. In 1878 he went thence to Denver, Colo., where he obtained an appointment with the Rio Grande railway, then being constructed. Later, he went to San Francisco, and after a time spent there as a mining broker, was some years prospecting in Arizona. Coming north to Spokane, Wash., he was first associated with others in working mining property, near Northport. In 1888 he went to Nelson, B. C., the discovery of the Silver King mine having attracted many men to that vicinity. Ever since then he has been interested in mining, and owned a number of mineral claims. Among others in which he was largely interested were the Dandy group, adjoining the Silver King, both of which properties were lately sold to a syndicate of British Columbians. The May & Jennie group, also near Nelson, is another property in the development of which Mr. Kelly spent much money. Eventually he organized the Reliance Gold Mining and Milling Company, of which he was managing director. This company equipped the May & Jennie with a milling and cyanide plant. He was also interested in coal and oil lands on the Pacific Coast.

SOCIETIES and TECHNICAL SCHOOLS

Appalachian Coal Operators' Association—At the annual meeting at Knoxville, Tenn., addresses were made by George H. Ashley, State geologist, and George E. Sylvester, State mine inspector of Tennessee; J. J. Rutledge, U. S. Geological Survey; George P. Chandler, John E. Beebe and John R. Williams. The following officers were elected: President, B. A. Morton, Knoxville, Tenn.; first vice-president, H. M. LaFollette, LaFollette, Tenn.; second vice-president, J. R. Wooldridge, Wooldridge, Tenn.; third vice-president, M. J. Moss, Pineville, Ky.; secretary, J. E. McCoy, Knoxville.

Utah Society of Engineers—The monthly meeting was held Feb. 17 at Salt Lake City. An illustrated lecture on "Power Plant Construction and Equipment" was given by J. W. Brinkerhoff, construction engineer of the Westinghour-Church-Kerr Company, who has had charge of the new Jordan river steam plant of the Utah Light and Railway Company, which is of modern design and uses steam turbines instead of reciprocating engines. The lecture was followed by an informal, but spirited discussion on the relative merits of automatic stokers. On Feb. 18, members of the society with friends inspected the 11,000-h.p. Jordan plant, and were taken in a special car over the company's new line to Sandy and Murray, where the substation which furnishes power for the interurban lines was visited.

Editorial Correspondence

Reports from our own Representatives on Important Events from Many Important Mining Centers of the World

San Francisco

March 1—The commencement of dry-placer mining in the eastern part of Kern county, the introduction of new capital into copper exploration and development in Shasta and Humboldt counties, and the enactment by Congress of remedial law affecting oil-land placers, are the chief features of progress in the mining industry in California occurring in the last half of February. While singly these occurrences have not attracted marked attention beyond the districts or industries affected by them, they form collectively an encouraging indication of advancement which should have a strong influence upon the ultimate results of the current year.

Prospecting of the gravel deposits in the Summit region, six miles north of Randsburg, in the last two years has disclosed occurrences of nonmagnetic black sand containing gold. The construction of dry-placer machines, capable of separating this black sand from the gravel and recovering the gold contents, as well as saving the gold found in the gravel, is reported to have been successful, and has resulted in the purchase of 160 acres of these deposits and the bonding of 200 acres. The profitable operation of these dry-placer machines will make possible the extension of similar operations to numerous large areas of gold-bearing gravel that have remained undeveloped for lack of water or other economic method of treatment.

The fact that cautious men who have made fortunes in the production of petroleum and the recovering of gold from the river beds and banks by dredging methods have taken financial interest in the exploration of an undeveloped copper region in Shasta county, lying between the Balaklala and the Iron Mountain mines, will do much to dispel the disbelief of doubters or to prove their doubts well based, as to further profitable occurrences of cupriferous ores in that region. The most encouraging feature of the undertaking of the Shasta Copper Exploration Company to decide quickly and effectually by the employment of diamond drills regarding the formation and its contents and value, is that the men behind the project are able to finance the development and operation in the event of their successful exploration. The report coming from Humboldt county that capital has been secured to properly equip the Horse Mountain copper property with smelting facilities, and to construct a wagon road to Korbel, whence the product of copper matte may be shipped by rail to tidewater at Arcata or Eureka, adds to the encouraging sign of advancement in the development of new copper resources. The Horse Mountain copper deposits lie in the northeast corner of the county and on the western edge of the great chain of cupriferous regions or districts extending in a northwesterly course through Plumas, Shasta, Siskiyou, Trinity and into Del Norte county. Sufficient exploration is said to have been done to warrant necessary equipment for practical development.

Assessment rates to be applied to oil pipe lines and pumping stations were agreed upon at a conference of assessors representing nine counties, held at Fresno on Feb. 26. The Standard and the Producers' will each be assessed at $3300 per mile for pipe lines, and $45,000 for each pumping-station plant. The Associated will be assessed $3300 per mile for similar pipe lines, and $3500 for rifled lines; $45,000 for pumping stations south and $50,000 for stations north of Mendota.

Denver

March 2—Such a gratifying instance of good management, healthy condition, and fat returns to the stockholders as that of the Elkton gold mine in the Cripple Creek district, certainly deserves special mention, both as an object lesson to other companies, and also as showing how undeserved is the present apathy to mining speculation and investment among those who have loose capital. Manager E. M. de la Vergne's report to the stockholders at the annual meeting March 1 shows that the gross production for the ten months ended Dec. 31, 1910, was $720,944, net cost of operating $450,421, net profit $279,876, showing that 40 per cent of the gross production was profit to the stockholders. During this period $387,500 was paid in dividends and the balance in the treasury in cash is $192,683. Up to Jan. 1 the total amount of dividends paid amounts to $2,704,460. This mine is on Raven hill which joins Beacon Hill under which is the breast of the deep drainage tunnel and was immediately affected by it, the water receding steadily at the rate of two feet per week and being now 30 ft. below the ninth level. Double shifts will now be put on the shaft which will be sunk day and night and orebodies opened up at greater depths. The Cripple Creek mines are credited with a February production of $1,273,570.

The zinc-ore buyers several weeks ago clubbed together and cut the price paid to Leadville producers $2.50 per ton, thinking they could force the latter to accept the cut, but the mines promptly ceased production. This brought the buyers to a frame of mind conducive to conference, the result of which is that the old price is practically restored and under a long time contract. So March 1, the Waterloo, Maid of Erin, Henriette, Adams, Wolftone, and Castle View on Carbonate hill, the Iron-Silver and the Carbonate of Zinc mines on Fryer hill will resume work and it would now appear that the zinc situation in Leadville is practically settled for some years to come. It is said that this settlement of the difficulties is largely due to the efforts of S. D. Nicholson, manager of the Western Mining Company.

The Tunnel Drainage Van Tilborg bill already alluded to in the JOURNAL was reported on favorably by the Senate, but some opposition has developed by the smaller mining concerns and owners of prospects who seem to be afraid that the tax will work a hardship on them, inasmuch as they will receive little benefit therefrom and that in the end it will be a confiscatory measure by which the big companies will gain control of the area involved, and drive out or absorb the little fellows.

Butte

March 1—On Feb. 27, the petition of the Boston & Montana Mining Company for dissolution was granted by Judge Lynch, of the District Court, in Butte. When the matter was called for hearing there was no one present to represent Lewis Seasongood, who had previously filed objections to the granting of a dissolution upon the ground that it would be a fraud upon the minority stockholders. It developed that Mr. Seasongood was a resident of New York and that he had attempted to get some Butte attorney to represent him but had been unsuccessful.

The legislative committee which has been investigating the sanitary condition of the Butte mines has made a report in which it is stated that everything possible is being done by the operating companies to better these conditions. The committee recommends for passage a bill which provides for certain improvements in the way of latrines, drinking water, etc.

Salt Lake City

March 2—The old Ontario mine at Park City has been taken under a 10 years' lease by the Crowther Company, in which a number of Salt Lake men are interested. It is estimated that there is at least a million tons of stope fillings and second-class ore broken in the middle and lower levels, and that this can be drawn cheaply, and treated at a profit by cyanide methods; 80 per cent. of the fillings are above the main tunnel, and will require no hoisting. Though some of the fillings have been in the stopes over 30 years, experiments indicate that they can be readily removed. During the past few months some of these fillings have been shipped direct to the smelteries, and are stated to have paid better than freight and smelting charges. What is left in the mine however is regarded essentially as milling ore, though some new ground will probably be opened. Henry Crowther has operated short-time leases on this property for the past two years employing from 25 to 50 men, and has made 160 shipments of one- to four-car lots. It is planned to expend in the neighborhood of $200,000 in improvements and equipment, and to eventually mill about 300 tons daily. Preliminary tests show that 98 per cent. of the gold and 80 per cent. of the silver can be recovered by cyaniding, when sliming, agitation, and filter press methods are employd. Much filling will run $6 and upward per ton.

The Ontario has paid $13,945,500 in dividends, the last payment being in December, 1902. The ore occurred in a large fissure vein in the quartzite, being up to 30 and 40 ft. between walls in places. The principal value was in silver, with some gold, and occasionally a small amount of lead. The mill ore is stated to have run more than $100 per ton for extended periods, and was treated by the Russel process. There are 60 miles of track in the mine.

A bill has been introduced in the State legislature, to provide for a uniform code of signals in coal mines throughout the State. The signals vary largely in different mines, with a corresponding probability of accidents, when miners change employment. A list of signals is included in the bill, which provides that they be posted in every mine.

Examinations for mine foremen and fire bosses for coal and hydrocarbon mines were held at Castle Gate, Feb. 20 and 21 by the Carbon county examining board and State Coal Mine Inspector J. E. Pettit. Out of 14 applicants, 5 passed successfully for foremen, and a like number for fire bosses. According to Inspector Pettit, the qualifications required in Utah for these positions are as high, if not higher than those in other States. Among those who failed were several applicants, who had passed similar examinations elsewhere.

Cobalt

March 3—The meeting of the shareholders of the Little Nipissing Mining Company, of Cobalt, called to inquire into the affairs of the company, revealed that there had been an over-issue of the stock much greater than was first thought. Up to date 644,244 spurious shares are known to have been issued, and it is believed that the over-issue is considerably in excess of this. There is no means of distinguishing between the good stock and the bad, so it has been decided to increase the capital from $1,500,000 to $3,000,000, thus validating all the stock and leaving a surplus in the treasury. It is proposed to call in all the outstanding stock and issue new certificates. A by-law has been passed authorizing the directors to borrow money in order to carry on the work at the mine. Criminal proceedings will be instituted against those who may be responsible for the over-issue.

The differences that have existed for some time between the Thomas A. Nevins and J. S. Bradley factions, in the Cobalt Central mines, and which have resulted in such ruinous litigation, for the shareholders, have been adjusted. The sale of the property has been withdrawn, all litigation has been brought to an end, and arrangements have been made to provide capital to carry on operations at the mine. It has been decided to issue $400,000 six per cent. ten-year gold bonds, the proceeds to be used in liquidating the company's debt, and developing the property.

Government engineers are preparing plans for the erection of a large dam at Lake Quinze, which lies north of the head of Lake Temiskaming. This is one of a series of storage dams that are being built to conserve the surplus water that accumulates in the spring and thus regulate the flow in the Ottawa river during the dry seasons. Lake Temiskaming is a body of water 70 miles long and in the spring the water sometimes rises to a hight of 20 ft. above low-water mark. A dam is now being constructed at the foot of the lake that will raise the level of the water 9 ft. Dams are also being constructed on Lake Kippewa, which, with its tributaries, has an area almost equal to Temiskaming. Here the water will be raised 10 ft. With this series of dams the entire flow in the Ottawa river can be regulated, and they will also form an important link in the projected Georgian Bay canal.

Construction has been started on the power dam at Sandy Falls, on the Mattagami river, which will supply electric power to the Porcupine camp. The necessary camps have been erected and part of the machinery is already on the ground. The power-house equipment will consist of two 1500-h.p. waterwheels and Westinghouse generators.

Toronto

March 3—The Ontario Government has decided to raise a loan of $5,500,000, of which $3,000,000 will be expended on the Temiskaming & Northern Ontario Railway. The extension to Porcupine will cost $600,000, and $55,000 will be spent on an extension from North Bay to connect in the Grand Trunk at Calendar. A large amount will also be devoted to new engines and other equipment.

The provincial government has introduced a revenue bill in the Legislature, providing for tax upon all stock transfers to the amount of 2c. for every $100 or fraction thereof of the par value on every change of ownership. The tax will not apply to the original issue of securities by any joint stock company, or to the transfer of stocks as security for loans. A similar tax has been in force for some years in Quebec. The principal objection taken to the tax is that it bears unduly hard upon the cheaper issues of mining stocks.

Chihuahua

Feb. 28—The interruption of railroad traffic and the interference with the distribution of supplies to the mountain regions of Chihuahua and Sonora resulting from the continued political disturbances is seriously affecting the operating mining companies. Practically no freight has been moved over the railroad west from Chihuahua since December and the traffic on the Mexico Northwestern running southwest from El Paso has been only operated intermittently for nearly as long a time. These two roads serve all of the important camps of the Sierra Madre region of Chihuahua. Some supplies have been taken in from the West via Alamos and points on the Yaqui River railroad, and several bullion shipments have been made through these western outlets. The result of the situation is of growing seriousness to the operators and plans are forming to petition both the government and the insurrectionists to permit the restoration of transportation in the interests of the mining companies and of the large Mexican population in the mining region who are directly and solely dependent on their wages from the mines for subsistence.

At the present writing it may be said that two-thirds of the mining area of Chihuahua and about one-third of Sonora is cut off from the usual transportation facilities by reason of the demoralization of railroad traffice and the suspension of the customary mountain transport by burro trains.

A large amount of mine freight is tied up at El Paso intended for shipment south over the National lines, which have been interrupted between Chihuahua and the north for nearly a month.

The Mining News

Reports of New Enterprises. New Machinery. Installations. Development Work and Property Transfers. The Current History of Mining

Alaska

The Iditarod has passed all records of virgin Alaska camps by shipping into Seattle $1,060,535 in gold since the first arrival last August. During February the assay office has received two consignments of $20,000 and $17,000 respectively. The shipment of more than a million within six months is a remarkable showing for a new district. Reports from the assayers show that the gold from this district is very fine, carrying only a trace of base metal.

Williams-Gentzler—Lumber has been shipped for the construction of the stamp mill on this property, near Valdez.

Kenai Alaska—A stamp mill is being shipped to this property. A large amount of ore is in sight; William Hawkins, superintendent.

Alaska Juneau—It is announced that a mill will be built during the summer. F. W. Bradley, Juneau, is president.

Bear's Nest—Preparations are being made for the opening of this property on Douglas island. William Mein, Juneau, will have charge.

Mills—This mine has been purchased by the de Groff Mining Company, of Sitka, and additional machinery will be installed. The property is on Chicagoff island.

Alaska-Treadwell—Twenty stamps will be added to this mill, making a total of 1000 stamps in operation on Douglas island, with a capacity of 5000 tons daily. Operations at the cyanide plant have been resumed for the treatment of 50 tons per day, and at the expiration of the Tacoma contract the entire output will be treated.

Arizona

Gila County

National Mining and Exploration—The advertised public sale of the property, to have been held in Globe, on Feb. 28 has been postponed until March 30; but from the satisfactory reports of the reorganization plans it is considered probable that the sale will be unnecessary.

Barney Copper Company—A car of 10-, 8-, 6- and 4-in. casing has been ordered and should arrive soon. With this equipment hole No. 2 will be sent through the orebody to determine its thickness.

Inspiration—Station cutting has begun at the bottom of the Colorado shaft on a level with the 500-ft. station of the Joe Bush. When the station is finished work will begin on the haulage drift that will connect the Colorado and Joe Bush shafts. Four drills are operating on the property, two of them, Nos. 803 and 805 are still in ore. The test mill is running smoothly and ore is being handled by the different makes of machinery being tested. There is a corps of engineers in the field near Wheatfields, about 11 miles from Miami, surveying the reputed site for the concentrator. There is considerable local comment as to the possible influence on the company's plans by the report of a water supply west of Miami. The nearest visible water is less than three miles west of the Inspiration and of considerably greater altitude.

Live Oak—Drilling in hole No. 49 on the southeastern end of the Live Oak ground was stopped at 245 ft. when the drill passed through the ore, the overburden being shallow at this point; the drill entered the ore at a depth of 20 ft. No. 52 entered the orebody at a depth of 60 ft. on the southeastern part of the ground, and is still in ore at a depth of 130 feet.

Copper Reef—The inclined shaft has reached the 500-ft. level and station cutting will begin immediately. As soon as the station has been cut crosscutting will begin to explore the two veins encountered by the shaft. The California tunnel has been driven 700 feet. Thus far it shows no change of formation.

California

Amador County

The Pacific Gas and Electric Company is extending its power line to Hardenberg mine, near Middle Bar.

Calaveras County

Water locations totaling 32,000 in. have been filed on American river for mining and other purposes.

James V. Coleman, of San Francisco, owner of the Angels mine, secured a verdict in his suit against the Lightner mine for $140,000. The value of the ore extracted was reduced by the jury to $1600. Other suits are pending.

Fresno County

Berkeley-Coalinga—This well at 300 ft., in Coalinga field, is flowing 15 to 20 bbl., of 20 gravity.

Inyo County

Skidoo—The 15-stamp mill is crushing 50 tons of ore per day.

Arondo—Twenty men are extracting ore from this mine in the Argus range.

Kern County

Associated Oil—This company has sold 120 acres in Lost Hills field to the Sterling, a subsidiary company.

Sante Fé—The topping plant of this company, at Taft, is taking about 23 per cent. off in tops and shipping it to a Los Angeles refiner, at 6c. per gal. Light crude oil thus treated is said to net about $1 per bbl.

Standard—Another strike has been made on Midway flat in light oil sand of about 20 to 25 gravity oil, with prospects of being a good producer. The 3200-ft. well of this company produced 20,249 bbl. of 14.9 gravity in January.

Midway View—This company is now running oil into the new steel storage tanks recently completed.

Nevada County

With the breaking of the road between Graniteville and Nevada City all the stage roads are now open in northern Nevada county and southern Sierra county, and should there be no further heavy snowfalls they can be kept open.

Union Blue Drift—It is reported that this mine, at North Bloomfield, will be reopened; Joseph O'Connor, superintendent.

Tidal Wave—Negotiations are pending with Eastern capital for resuming operations and working virgin ground in this drift mine near North Bloomfield; James C. Haney, owner.

Rose Hill—There is probability that this mine, situated within the limits of Grass Valley, is to be reopened.

Sacramento County

Union Dredging Company—Prospecting with Keystone drill on American river, near Folsom, is completed, and plans are said to be in preparation for the construction of a dredge; Andrew Turner, Folsom, superintendent.

San Bernardino County

Mojave—New equipment including a 40-stamp mill is to be erected.

Needles Mining and Smelting—The smeltery and mill are expected to be ready for operation before the end of the month. Custom ores are now being received at the smeltery.

Shasta County

Shasta Copper Exploration Company—This company will employ two diamond

drills in exploring its claims in the copper region between the Balaklala and the Mountain Copper Company mines. O. Scribner (of Associated Oil Company), San Francisco, secretary.

Bully Cave—E. J. McLaggon, superintendent, is working 10 men in this copper mine, near Winthrop.

SISKIYOU COUNTY

Scott River Dredging Company—The power house of this company on Scott river, was destroyed by fire caused by a defective transformer, Feb. 27; loss, $75,000. This power plant supplied power for neighboring mines, its own dredge and lights for Callahan.

TUOLUMNE COUNTY

Rawhide vs. Dutch Consolidated—This is a suit alleging damages of $250,000 for trespass in mining ore and flooding tunnels on plaintiff's ground.

Gold Ship Consolidated—H. L. Bean and others are contesting in the U. S. Land Office, at Sacramento, this company's placer claim, on the ground that it is better adapted to ledge mining.

Carlotta and Pennsylvania—These mines are to be fully equipped with new machinery.

Colorado

GILPIN COUNTY

Old Town—The Pike Leasing Company is stated to have received returns from shipments amounting to about $22,700 during the last 13 months.

LAKE COUNTY—LEADVILLE

Resurrection—Lately there was such a heavy flow of water from Resurrection No. 2 shaft that it got the best of the pumps and the Yak tunnel had to lay off a number of men, but heavier pumps will be installed at once and the force put back.

Crown Point and Pinnacle—These mines on Rock Hill were among the producers of rich ore in the early days and lessees are now actively prospecting them for carbonate of zinc ore.

Dinero—From this tunnel on Sugar Loaf last week 150 tons of ore were sent to the smeltery. The output is hampered at present by almost impassable roads.

Chrysolite—This property, which has not been mined for many years, has now been leased by H. E. Burton and associates, and will be actively prospected for carbonate of zinc ore.

Baby—From the 200-ft. level of this mine, in California gluch, N. Hill & Co., lessees, are sending out about 30 tons of silver-lead ore daily and at the mine adjoining Nord & Co., lessees, are said to be shipping about 15 tons of silver-lead ore daily.

Fanchon—A small tonnage of lead ore carrying gold is being produced by this mine on Sugar Loaf. John Christensen, lessee.

Continental Chief—The opening of several ore-streaks carrying gold is reported from this mine at the head of Iowa gulch.

SAN JUAN REGION

Silver Ledge—The shaft is being sunk and development work is in progress.

Intersection—Rich ore is being mined, from near the level of the Iron Mask tunnel.

Gold King—Operations have been suspended pending the opening of the Silverton, Gladstone & Northerly Railroad.

Columbus—The Laura drift is being extended north to reach ore above the Columbus tunnel.

Vermillion—The mine is producing good ore from the level of the Rattle tunnel.

Tomboy—The mill ran 26 days, crushed 9100 tons of ore yielding $30,000 in bullion and $33,500 in concentrate, at a cost of $38,500 Expenditures on improvements totaled $120.

Camp Bird—Reports are rife in Ouray that a very rich strick of gold has been made, but as the policy at the mine is to give out no information, the news, if true, will come here from London first.

Barstow—This gold producer in the Red Mountain district is said to be in good ore again.

Bright Diamond—The mill is running steadily. This mine is on the same hill and beneath the American Nettie.

Yankee Girl—This mine, above Ironton, in the Red Mountain district is said to be producing 300 tons per month of silver-lead and copper ore.

Suffolk—Lessees on this old-time gold producer have drifted into a good body of milling ore.

Favorite—This mine, at Ophir, has shipped another gold bar to the mint.

Alta—The Wagner Development Mining Company, leasing this mine, is adding 10 stamps to its mill in Gold King basin. For a year past the company has been shipping from 15 to 20 carloads of concentrates per month to the Durango smeltery and a carload a day will be the output when the new machinery is installed.

SUMMIT COUNTY

King Solomon—From this tunnel near Frisco comes a report of the opening of a vein of galena ore carrying gold.

TELLER COUNTY

Stratton's Independence—Production for January was 2641 tons of ore averaging 15 dwt. 13 gr. gold. Low-grade mine and dump ore milled, 9226 tons; net working profit, $10,800 less $1700 spent on special development.

Isabella—This Bull Hill mine is credited with a production of 44 cars of ore in February. It came from the Lee shaft and the Empire State mine.

Idaho

COEUR D'ALENE DISTRICT

Tam O'Shanter—Extensive development work will be done this season.

Hector Mining Company—This company has secured the Mayflower mine.

Terrible Edith—Rich ore has been struck; 40 sacks were recently shipped to the smeltery.

Coeur d'Alene Nellie—This mine has resumed production of silver-lead ore. E. C. Meiklejohn, manager.

Indiana

BLACKFORD COUNTY

The oilfield shows less completed work than in any previous week for some time. Just at the present time the oil men do not know which way to turn to open up something new. In this and other Indiana fields only five wells were completed during the past week. All the wells are producers, but not gushers.

GREENE COUNTY

The Island Valley mine, the property of the United Fourth Vein Coal Company, has obtained a large coal contract from a Chicago firm. The contract calls for 500 tons per day. This and other contracts will give the mine a steady run with an increased force.

W. L. McVicker, lessee of the P. & I. coal mine, near Jasonville, will sink two additional shafts. He has purchased the Boston Hill mine east of Midland, and will sink a slope to No. 4 vein which is 4 ft. thick. He owns 80 acres of coal land adjacent to the territory, and has an option on 400 additional acres, and will sink a shaft to No. 3 vein. The Monon railroad has begun the building of a spur to the field.

KNOX COUNTY

A satisfactory showing of oil was obtained in a deep-test well drilled by the Pure Oil Company, near Oakland City, Feb. 23. The oil was found at a depth of 2000 ft. The well is now shut down and will be drilled in later. The oil sand was only touched by the drill. The find is considered important and has created great interest. The oil is thought to be in Trenton rock.

SULLIVAN COUNTY

A dust explosion in the Hamilton mine near Hymera, imperiled the lives of 75 miners on the morning of Feb. 24. Four men were badly burned and it was thought for a time that 25 miners were imprisoned in the mine. They were rescued later.

Work has been resumed in the Ham-

ilton mine, near Hymera, which was the scene of an explosion a week ago. Not much damage was done, and the men who were burned will recover. No arrests have been made, although the explosion was due to an illegal shot.

VIGO COUNTY

A large number of suits have been filed against the National Coal and Fuel Company, with offices in Terre Haute. Each of the complainants ask for a judgment of $100. The defendant mining company is charged with negligence in the construction of entries in the National mine, which allowed a creek to overflow the mine and tools, powder and fuses belonging to the employees. They also charge that various amounts of coal were mined ready for hauling and that a loss was incurred by complainants. The question is a new one, and is attracting considerable interest.

Michigan

COPPER REGION

Winona-King Philip—A circular has been issued to the shareholders of the Winona Copper Company relative to the proposed consolidation with the King Philip, proposing a 100 per cent. increase of stock. Of the new issue of 200,000 shares, 166,666 will be exchanged for King Philip shares at the ratio of two Winona for three King Philip; there will remain in the treasury 33,334 shares.

New Baltic—Sinking has been resumed below the 200-ft. level, where a station was cut and a crosscut started, but as the formation is shattered, it was decided to put the shaft down to a greater depth before driving to the lode.

New Arcadian—This mine has two drilling outfits in operation, one drilling for the Arcadian; the other for the Kearsarge lode.

Ojibway—This property will probably begin shipments during the summer to one of the mills in the district available for custom stamping.

Cliff—The new shaft on the Kearsarge lode is down over 100 feet.

Algomah—Over 800 ft. of drifting has been done at the 104-ft. level and throughout that distance the same high-grade copper ore has been in evidence that has characterized this property from its surface opening.

Minnesota

CUYUNA RANGE

Aitkin—It is generally believed that the Soo railroad intends to do some drilling in this vicinity. It is said to have acquired options on about 400 acres of land and the owners of the land expect to see a number of drills at work this spring. Whether or not marketable ore will be found is questionable, as reliable data seem to indicate that there is a large schist area underlying this region.

Meachem—This shaft is owned and operated by the Rogers-Brown Ore Company. It was completed several months ago by the New York Foundation Company. Drifting on the orebody is now in progress from the bottom of this shaft, and some fine ore is being found. This shaft will be on the shipping list next spring.

Work—Although general exploration work is perhaps a little more dull just now on this range than it usually is at this time of the year, everything seems to point to a busy summer. There have been an encouraging number of land trades up to date, a number of new exploration companies have been organized, and there will be an unusually large number of drills at work this coming season.

VERMILION RANGE

Almar Iron Company—In general, the property of this company is about a mile from the county road between Tower and Ely. In the way of equipment, the company has good camp buildings, a boiler, hoist and air compressor. The shaft is down about 70 ft. Additional land has recently been secured.

Chicago-Vermilion Iron Company—The lands to be explored by this company lie to the west of the Rice Bay Company's property. Camps have been built and some test-pitting done, and it is now reported that a shaft is being sunk.

Mesabi-Vermilion Iron Company—E. C. Kennedy, of Duluth, is interested in this company. The land was drilled a number of years ago by D. H. Bacon, for the Minnesota Iron Company. Last summer this company took under option, two properties, upon which ore has been found by drilling, and a shaft is now being sunk.

Missouri

JOPLIN DISTRICT

Granby—This company has let the contract for the erection of a new modern mill of large capacity to take the place of the mill which burned.

Davey Crockett—This company, operating northwest of Carthage, has sunk a drill hole in the bottom of a 100-ft. shaft north of the Mill shaft, which struck ore from 195 to 215 feet.

Oronogo Circle—This company has sold its pile of 1000 tons of jack on a $41 basis.

Cliffwood—This company, at Neck City, will erect another 800-ton mill on the lease northwest of Neck City. B. L. Van Hoose, Carthage, manager.

Hackett—This company, having removed its installation of Richards pulsator jigs, has completed the installation of Cooley jigs and resumed milling. The report that the Richards jigs would not successfully handle the Joplin ore appears to be incorrect. In a test run the feed averaged about 2 per cent. blende and the tailings only a little over 0.5 per cent. In this run the fine material was screened out to go to tables, the jig feed comprising only the coarse material. The abandonment of the Richards jig was evidently due to reasons other than its inability to do good work on the Joplin ore.

Montana

BUTTE DISTRICT

Moulton—The property is owned by W. A. Clark and was not worked for a period of 12 years until recently, when work of repairing the shaft was begun. The work has progressed to the 200-ft. level and the shaft from there down to the bottom is in fair condition.

CASCADE COUNTY

Anaconda—The company has recently purchased from W. H. Albright 1500 acres of land, which include the limestone quarries, which have been supplying all this material for fluxing purposes for the Boston & Montana smeltery at Great Falls. Mr. Albright will retain the water rights and such gypsum deposits as may be developed in the lands sold.

FERGUS COUNTY

Barnes-King—The Western shareholders won the contest for control and John Kirk, C. W. Goodale, Walter Lewis and John E. Corette were elected directors. It was voted to move the offices back to New York.

Mellor Gold Mining and Development Company—The company has recently been incorporated by R. John Mellor, Dr. George E. Mathews, Dr. J. E. Cowperthwaite and George Lester for the purpose of operating claims in the Maiden district. Work has already been begun.

GRANITE COUNTY

Sheehan, Durbin & Jackson, who recently leased the Montana mine, have also taken a lease on the Glenn mill and are now treating their ore.

Oro Fino—The work is confined to opening up new orebodies and carrying on general development work. Charles Bostrom is operating the property.

Gold Coin—The option given to Fred. L. Klein, of Denver, by Yegan Brothers, expires on April 4, and necessitates the payment of the $25,000 purchase price in full by that time. H. S. Sanderson, a Denver mining expert, has completed his investigation of the property on behalf of Mr. Klein.

JEFFERSON COUNTY

Amazon-Montana—On the 350-ft. level the Silver Star vein has recently been in-

tersected; drifting on the orebody will be begun at once.

LEWIS & CLARK COUNTY

Strawberry—The new mill will be started the middle of March.

MADISON COUNTY

Edward Johanson has started work on the North Star claim, situated in Brown's gulch. He has recently secured a lease and bond on the Monte Cristo in the same section. After reaching a depth of 70 ft. on the Schermerhorn claim, he was forced to suspend operations temporarily on account of water.

Nevada

HUMBOLDT COUNTY

The building of a railroad from Winnemucca, to Idaho via McDermitt and National, has been proposed and steps are being taken to finance the enterprise.

Arizona—This old mine has been sold, a mill will be built, and operations resumed.

1910 *Mining Company*—The mine, at Barrett Springs, is shipping ore.

Last Chance—The tunnel is 700 ft. in; the shaft 75 ft. deep at this silver-lead mine.

National—Silver, as well as gold ore is found near the property of the National Mines Company.

Big Four—This mine is now producing gold ore.

LANDER COUNTY

It is understood that the old mines at Cortez are to be worked again by Des Moines people.

Old Jersey—This silver-lead mine, 50 miles south of Battle mountain, has been sold.

Oklahoma

L. C. Church has the water lowered in his deep shaft to the depth of 180 ft. The water will have to be lowered to 230 ft. before mining can be begun. This pump drains the entire camp.

Davis—This new camp in southern Oklahoma, is soon to have three mills. The United Mines Company, Arbuckle Mining Company, and the Rumney Mining Company, are preparing to erect mills on their properties.

Miami Royalty—This company has its shaft down to 180 ft., and is now waiting for the water to be lowered so sinking can be resumed.

John H. Molloy—The shaft of this company is in ore at the depth of 180 ft.

Miami—There is a surplus of 2500 tons of blende in the bins.

Oregon

BAKER COUNTY

Big Elk—Assays show the ore from this property is high grade. C. L. Cox, owner, has had a crew at work all winter.

Red Boy Consolidated—Deep sinking will be started Mar. 1, under the direction of J. Farrell, manager, Sumpter.

Niagara—Free gold has been encountered in the tunnel on this property. A. C. Greenlee, Sumpter, is one of the owners.

GRANT COUNTY

Golden Chariot—Some rich ore has been encountered in the mine; Connor Brothers, Sumpter, owners.

Mollie Gibson—Many improvements are to be made this spring; W. J. Evans, manager.

JOSEPHINE COUNTY

Gold Note—This property has been sold by Hendricks & Crouch, of Grant's Pass, to Portland men, represented by John Wickham. Development work will be started at once and new machinery installed.

Greenback—Another rich strike is reported on this property, which is being operated by Thompson & Anderson, Grant's Pass. Twenty stamps are in operation and 50 men are employed at the mine.

Utah

JUAB COUNTY

Tintic shipments are increasing. For the week ended Feb. 17, 171 cars including two cars of slag from the Tintic smeltery were shipped. The shipments total 172 cars for the week ended Feb. 24.

Crown Point—Drifting is being done on the 260-ft. level of the new shaft, for the first of two known veins.

Colorado—A shipment of 40 tons of high-grade ore has been made, which was extracted in opening a body of the usual grade.

Dragon Iron—It is thought the proposed consolidation between this property and the Governor will be approved.

Iron Blossom—The 600-ft. level has been driven south to the Governor line. This work is in ore. Shipments have been increased to between five and six cars daily. The question of a new smelting contract has not been settled, but trial shipments are being made to the Murray smeltery, and it is probable that a contract will be signed for a certain minimum tonnage, which the Iron Blossom can provide regularly. A third shift has been added, which brings the number of men employed up to about 85. Since shipments have been increased, 200 tons daily are being sent out from the No. 1 shaft. Most of this ore comes from the 500 level. With the exception of the Centennial-Eureka the Iron Blossom shipments are now the largest from the Tintic mines. Heretofore the fifth level of the No. 1 shaft has been the point of greatest interest, but recent work on the sixth level has cut the same orebody making north and south. It is said that shipping ore 40 ft. wide is being followed toward the 600 from the No. 3 workings.

Gold Chain—The company is mining ore from the body developed in the Dom Pedro claim, owned jointly with the Mammoth, but outside of this ground.

Plutus—There has been some talk of resuming operations on this property, and it is understood that the Grand Central interests may take it over.

Scranton—A 700-ft. spur and loading station has been built from the railroad at Del Monte. Preparations are being made to increase the output, which is at present around 600 tons per month. Both lead and zinc ores are shipped.

SALT LAKE COUNTY

Progress is reported in the proposed merger of several Alta properties, which include the South Hecla, City Rocks, Continental Alta, Copper Prince and Alta Development. Michigan men are interested. It is proposed to drive a drain and operating tunnel which will eventually be four miles in length, and which will start from the Continental mill near Tanner's flat. Besides giving depth and drainage to a large territory, this tunnel will afford safe transportation through the snowslide area.

Tintic Mining and Development—This company, which owns the Yampa mine at Bingham, is reported to be out of debt, and to be shipping 550 tons of ore daily.

Silver Shield—It is announced that the low-grade lead and zinc ores recently tested did not give satisfactory returns.

Ohio Copper—There are reported to be funds enough from the monthly earnings to pay interest on the bonds, which fell due March 1. The company claims to be earning from $20,000 to $22,000 monthly, with two sections of the mill in commission.

Utah Consolidated—According to Eastern reports the latest measurements of ore reserves gave 40,000 tons of 3 per cent. ore, or about four months' supply at the present rate of production. Nearly one-half of this has been shipped since the measurements were made. The company also has about 200,000 tons of 2½ per cent. ore, and 60,000 tons of lower grade. At present little profit can be made on ore running less than 3 per cent. There is a possibility of the company's securing additional territory.

Rexall—The tunnel is in 800 ft., and drifting is being done on a fissure, showing oxidized copper minerals.

West Prince of Wales—This property consists of nine claims, which are being developed by two tunnels from Silver Fork of Big Cottonwood. The tunnels are on opposite sides of the cañon.

Lucky Dutchman—This group adjoins

the West Prince of Wales on the south, and is being opened by a tunnel, which is headed toward the City Rocks.

TOOELE COUNTY

Utah—Three cars were shipped from this Fish Springs mine during February. Ore is being mined on all levels from the 800 up. Four 10-horse freighting outfits are employed in hauling to the railroad at Oasis.

Washington

FERRY COUNTY

Iowa—The tunnel is now in over 30 ft., and considerable work will be done this spring. The property is near Orient on First Thought hill.

Majestic—The first contract on this property is completed, and E. P. Langer, Orient, is negotiating for another.

Cuba—H. Yake, Kettle Falls, manager, is making preparations to operate on an extensive scale.

KING COUNTY

Seattle Cascade—This company is considering the installation of a concentration plant of 100 tons capacity. E. E. Blumer, of Seattle, is interested.

KITTITAS COUNTY

Ellensburg Silica Land Company—A large deposit of silica sand has been located near Ellensburg, and investigations are being made to determine its value in making glass.

STEVENS COUNTY

Big Joe—Galena ore has been encountered in the main tunnel on this property, near Chewelah; J. Wilson, manager.

Canada

BRITISH COLUMBIA

Molly Gibson—This mine has resumed shipping to the smeltery.

Portland Canal—The ore is wider in a drift on No. 3 level and above normal grade.

Van Roi—Three cars of machinery for the concentrating mill on Four-mile creek have been received at Silverton.

Lucky Jim—Arrangements have been made with the Canadian Pacific Railroad to construct a spur line from Three Forks to near the mine, which has been without transportation facilities since the burning of the trestles last summer.

Phœnix Amalgamated—Ore is being shipped to the smeltery at Trail.

Hidden Creek—About 6000 ft. of diamond-drill cores has been made since last November. Nine holes were drilled which encountered ore in substantial amounts and of good average copper content.

Rambler-Cariboo—About 200 tons of galena ore are being shipped each month.

Fife—Contracts for 5000 ft. of diamond drilling have been let.

NOVA SCOTIA

North Atlantic Collieries—A writ of foreclosure issued by the Eastern Trust Company claiming $930,351 on behalf of the bondholders has been issued, the company having defaulted in its bond interest on Jan. 1. B. A. Weston, manager of the Trust Company, has taken possession of the property.

ONTARIO—COBALT

The shipments from Cobalt for the week ended Feb. 24 were: McKinley-Darragh, 188,080; Cobalt-Lake, 181,510; Coniagas, 123,740; Beaver, 121,276; Nipissing, 65,860; Crown Reserve, 64,000; Chambers Ferland, 64,000; La Rose, 63,710; Buffalo, 62,570; Townsite, 40,000; total, 974,746 lb. Bullion shipments: Crown Reserve, 26,840; Nova Scotia, 33,156; O'Brien, 15,832; Buffalo, 14,832; total, 90,666 ounces.

It is announced that the Harris-Maxwell claims at Larder Lake will pass into the hands of an English syndicate. A meeting of the shareholders will be held in a few days to ratify the transaction.

Thelma—This gold property in Bryce township will install a complete compressor plant and a 5-stamp mill.

Savage—This subsidiary property of the McKinley-Darragh produced 80,000 oz. of silver during February, which is 20,000 oz. in excess of the output for any previous month.

Green Meehan—High-grade ore has been found on this property. Work has lately been resumed after a shutdown of several years.

Cobalt-Lake—At the annual meeting the proposal of the directors to purchase capital stock of the company, to reduce the authorized capital to $3,500,000, was agreed to. The present capital is $5,000,000 with $3,929,166 issued. The reduction will cost about $175,000, and purchases must be made in the open market. Cash on hand and due from smelters is about $84,343.

ONTARIO—PORCUPINE

Bewick, Moreing & Co. have already purchased two complete plants for their Porcupine properties, and as soon as the machinery is on the ground will start sinking four shafts. The work will be carried on as expeditiously as possible.

Gold Ridge—Work will be resumed on the Higginson Veteran claim.

Imperial—Free gold has been found at the bottom of a 40-ft. shaft.

Swastika—A shaft is down about 150 ft. A 5-stamp mill has been installed and put in operation.

Edwards-Young Syndicate—W. E. Edwards and C. T. Young have staked eleven claims, two miles west of Wawaitan falls and about eight miles southwest from the Hollinger, on what they claim to be the continuation of the Timmins lead in Tisdale.

Mexico

CHIHUAHUA

Julietta—Denny Brothers have relinquished their lease and purchase option on this mine in the vicinity of Jiminez, and the property is again being developed by the owners, Cinther and Lujan.

Buena Tierra—This property, in the Santa Eulalia camp is producing at the rate of 150 tons daily, the product going to the Chihuahua smeltery.

Santa Inez—The discovery of rich silver ore is reported from this property in Parral. Shipments are being made.

Galeana—This property, in the Guadalupe y Calvo section has passed into the control of English people who are to begin extensive work.

Yoquivo—This company is closing down its mill on March 1 awaiting better opportunity for freighting in machinery for enlargement of the plant. There is also considerable difficulty in freighting in supplies from Cuesta Prieta on account of the revolutionary disturbances. The company has been making an excellent showing for many months and has ample ore for continued profitable operations.

Rio Plata—This and other companies operating in the western part of the state are freighting supplies and shipping out bullion via Alamos and other Sonora state points on account of the difficulty of securing freighters to the railroad to the east incidental to the political disturbances.

Cusi—Shipments have been practically discontinued on account of the tieup of railroad service. It is reported that the company will install a new milling plant and add considerable new machinery. M. W. Crossette is manager.

Cienega—A shipment of bullion valued at $5500 was lately made via Alamos.

La Republica—During January 1067 tons of ore were milled; value of product 72,263 pesos; operating and development charges 50,858, and construction charges 5736 pesos.

COAHUILA

Zinc Smelter Company—This Saltillo company in planning to build a zinc smeltery.

Norway

The 500-ton Elmore concentration plant at Sulitelma, after two years operation, is again being enlarged with increase of capacity up to about 900 to 1000 tons per 24 hours, thus constituting the largest flotation plant in the world for treatment of copper ores. The plant consumes for each ton of ore treated 2.7 lb. of common fuel oil and no acid.

Asia

Oriental Consolidated—The February cleanup was $133,000.

The Markets

Coal Trade Review

New York, March 8—Coal trade in the East continues quiet. It begins to look like a late opening of the spring trade, and everyone is waiting just now.

In the West the situation remains bad. Nearly all markets are reporting oversupply and low prices. Talk about combination continues, and it is believed that strong effort will be made to secure some united action. The difficulty seems to be to devise plans which will be attractive to operators and at the same time keep within the law.

Coal Rates to the Lakes—The Interstate Commerce Commission has begun to take testimony in the matter of advanced rates for the transportation of coal from the Pocahontas fields to northwestern points. The testimony is being taken before special examiner Rynder; the first witness was T. S. Davout, of Roanoke, Va., vice-president of the Norfork & Western. Mr. Davout has testified that the advances proposed are about 9c. per ton. Shipments of Lake coal from the line of the road were 1,333,262 tons last year.

Coal Traffic Notes

Coal shipments of mines in the Southwestern Coal Operators' Association year ended Dec. 31, short tons:

	1909.	1910.	Changes.
Missouri	2,574,873	1,908,038	D. 666,835
Kansas	5,779,397	3,284,574	D. 2,494,823
Arkansas	2,090,540	1,442,178	D. 648,362
Oklahoma	2,554,566	2,165,329	D. 389,237
Total	12,999,376	8,800,119	D. 4,199,257

Total decrease in 1910, as compared with 1909, was 47.7 per cent. The large loss was due to the strike last year, which continued over five months.

Bituminous-coal and coke tonnage of leading railroads in Pennsylvania and West Virginia, year ended Dec. 31, short tons:

	Bituminous.	Coke.	Total.
Pennsylvania	41,497,912	12,822,695	54,320,607
Balt. & Ohio	31,322,055	4,278,197	35,600 252
Buff., Roch. & Pitts.	7,589,115	667,386	8,256,501
Buff. & Susqueh'na	1,478,629	286,008	1,764,637
Penn. lines, N. Y. C.	7,925,155	72,716	7,997,871
Pitts. & L. Erie	11 645,126	5,996 985	17,642,111
Pitts. Shawmut & N.	1,245,524	21,053	1,266,577
Norfolk & Western.	17,451,098	2,645,055	20,096,153
Ches. & Ohio	15,829,531	409,283	16,238,814
Virginian	1,426,312	40,599	1,466,911
Total	137,410,457	27,239,977	164,650,434
Total, 1909	118,804,484	26,346,628	145,151,112

Increase in coal, 18,605,973 tons, or 15.7 per cent.; increase in coke, 893,349 tons, or 3.4 per cent.; total gains 19,499,322, or 13.4 per cent. Anthracite tonnages of Pennsylvania and Baltimore & Ohio are given elsewhere.

Anthracite tonnage of Baltimore & Ohio Railroad year ended Dec. 31 was 988,509 tons in 1909, and 1,114,480 in 1910; increase, 125,971 tons.

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Coal shipments over railroads in the Ohio Coal Traffic Association, year ended Dec. 31, short tons:

	1909.	1910.	Changes.
Hocking Valley	3,433,550	4,777,478	I. 1,343,928
Toledo & Ohio Cent.	1,415,247	2 186,435	I. 771,188
Baltimore & Ohio	1,590,041	2,455,473	I. 865,432
Wheeling & L. Erie	3,249,819	3,771,737	I. 521,918
Cleve., Lorain & Wh.	2,634,233	3,053,998	I. 419 765
Zanesville & Western	1,121,137	1,245,103	I. 123,966
Toledo Div., Pen. Co.	1,899,183	2,331,160	I. 431,977
L. Erie, Alliance & W.	1,153,611	1,328,594	I. 174,983
Marietta, Col. & Clev.	84,041	94,101	I. 10,060
Wabash-Pitts. Term.	36,314	63,291	I. 26,977
Total	16,617,176	21,307,370	I. 4,690,194

The total increase in 1910 over 1909 was 28.2 per cent. Baltimore & Ohio tonnage is of the Ohio lines only; main-line tonnage is given elsewhere.

Anthracite shipments in February were 5,070,948 long tons, being 833,169 tons less than in January. For the two months ended Feb. 28 the shipments were, in long tons:

	1910.	1911.	Changes.
Reading	2,254,590	2,079,921	D. 174,669
Lehigh Valley	1,724,775	1,921,727	I. 196,952
N. J. Central	1,247,849	1,406,011	I. 158,162
Lackawanna	1,604,578	1,549,454	D. 55,124
Del. & Hudson	973,672	1,187,532	I. 213,882
Pennsylvania	1,020,089	1,044,454	I. 24,365
Erie	1,106,749	1,353,671	I. 246,922
N. Y., Ont. & West.	407,101	432,295	I. 25,194
Total	10,339,403	10,975,065	I. 635,662

The total increase this year was 6.3 per cent. The Philadelphia & Reading and the Delaware, Lackawanna & Western showed decreases; all the others gained.

New York

Anthracite

March 8—Cold weather has given a little push to the market. Otherwise it is quiet, as dealers are using up their stocks as closely as possible.

Schedule prices for domestic sizes are $4.75 for lump, $5 for egg and stove and $5.25 for chestnut, all f.o.b. New York harbor. For steam sizes current quotations show a little more variation, and may be given at $3@3.25 for pea; $2.25@2.75 for buckwheat; $1.75@2.20 for buckwheat No. 2 or rice; $1.35@1.65 for barley; all according to quality, f.o.b. New York harbor. The lower figures are usually for individual and washery coals. No. 2 buckwheat and barley have been a little scarce, and 5 or 10c. premium is reported paid for prompt supplies.

Bituminous

There is little change to report in the market. Both harbor and coastwise trade are quiet, and little is doing yet on yearly contracts.

Prices are nominally about the same. Gas coals bring $1@1.10 at mine for ¾-in., 95c.@$1 for run-of-mine, and 70c. for slack. Fair steam coals can be had for $2.60, f.o.b. New York harbor, lower grades down to $2.35@2.45, with better coals up to $2.80@2.90. There seems to be still some surplus of coal at tide, so far as Pennsylvania coals are concerned. West Virginia coals are in better shape, owing to the holding back of the producers.

Car supply and transportation are about normal. In fact more cars could be had if they were wanted.

In the coastwise trade, vessels are moving more freely. Rates are firm, however, perhaps a shade higher. Large vessels ask 75@85c. from Philadelphia to Boston or Portland. Smaller boats ask 65@75c. from New York to points around the Cape; 30@40c. to Providence and the Sound.

Birmingham

March 6—The coal situation in Alabama is picking up again. There is a large production on, however.

The chief State mine inspector, James Hillhouse, is still working on the figures for the aggregate output at the mines during the past year. With six or seven small mines yet to be heard from, a total production of 16,100,000 has been accounted for last year.

The coke production is still good in Alabama. The demand is about equal to the output. The quotations are firm.

Chicago

March 6—The coal trade continues dull, with little hope of a revival, since all kinds are in abundance and weather conditions do not promise business for the future. The greatest demand now is for screenings from Illinois and Indiana mines; domestic coals are very weak. Prices do not lag notably, but the lower-priced coals are chiefly in demand, with the result that the higher-priced sometimes sell at cut prices to escape demurrage charges. Shipments in general are too large to this market.

Illinois and Indiana coals bring $1.80@2.40 for lump, $1.70@1.85 for run-of-mine and $1.65@1.85 for screenings. Eastern coals are weak. Smokeless lump is cut as much as 40c. in some cases

from the circular price of $3.95, and run-of-mine as much as 35c. from the circular price of $3.30, depending on the amount on track. Hocking holds up nearly to the circular price of $3.15, the supply having been restricted. Anthracite is very sluggish and is expected to continue so, in view of the expected April discounts.

Cleveland

March 6—The general tone of the market is better, chiefly on account of a better demand for steam coal. Most mines, however, are working only on orders, and are not piling up coal. Slack is rather scarce.

Nominal prices for Ohio coal, f.o.b. Cleveland, are $2.15@2.20 for 1¼-in., $1.90@2 for ¾-in., $1.80@1.90 for run-of-mine and $1.50@1.65 for slack. Some slack has been sold for 10c. above these figures.

Indianapolis

March 6—The Indiana coal operators report slight improvement in mining conditions during the past week. The majority of the mines were operated three days against two days the preceding week. The railroads report that several thousand coal cars have been ordered for March 15 and by April 1 there will be a good demand for Indiana coal.

Pittsburg

March 7—Pittsburg coal shippers are much pleased at the turn matters have taken before the Interstate Commerce Commission in the general issue as to differentials in rates to the Lake between Pittsburg and West Virginia. Their expectation is that the West Virginia rates will be left intact and eventually the Pittsburg rate reduced.

Secretary of War Dickinson yesterday decided against the petition that he order three of the seven bridges across the Allegheny at Pittsburg raised at once, with the idea of having the other four raised later. This is the third time such a plea has been unsuccessful. It was made at this particular time because, on account of the recent union of Pittsburg and Allegheny, the authorities are about to purchase some or perhaps all of the five highway bridges, the other two of the seven being railway bridges. The decision is against the river interests, composed chiefly of coal operators.

The local coal market continues quiet, with prices irregular, and mines running about half capacity. We quote: Mine-run and nut, $1; ¾-in., $1.10; 1¼-in. $1.20; slack, 82½@85c., per ton at mines.

Connellsville Coke—The market has been very quiet, with no sales of consequence, but prices are firmly held: Prompt furnace, $1.55@1.60; contracts to July 1, $1.60@1.65; contracts for second half, $1.80@2; prompt foundry, $2@2.10; contract, $2.25@2.50. A number of foundry coke contracts expire April 1, but there are no active negotiations for their renewal as yet.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ended Feb. 25 at 339,388 tons, a gain of 17,000 tons, and shipments at 3727 cars to Pittsburg, 5740 cars to points west and 890 cars to points east, a total of 10,357 cars.

St. Louis

March 6—The weather has again been warm this week and the market is resting on the bottom, prices on all grades of coal being based on the cost of production. Dealers, however, have been doing a fair business, though they are still working on storage coal and are buying very little on the outside. Steam plants are all running light.

Screenings, however, are in strong demand and they are worth more than mine-run and almost as much as lump coal. This is the first time in the history of the coal trade in Illinois when the price of screenings has been higher than mine-run. The tendency toward higher prices for screenings has been growing for some time.

The Carterville district seems to be faring very little better than the Standard and the mines in that part of the State are not able to run over two days a week on account of the lack of business, though prices on the whole are being held up better than in the Standard district.

The demand from the country is just a trifle better and it is evident that stocks on hand are decreasing.

Illinois, Standard:	Mine.	St. Louis.
6-in. lump and egg	$1.10	$1.62
2-in. lump	1.00	1.52
Mine-run	0.90	1.42
Screenings	0.60	1.12
Trenton:		
6-in. lump and egg	2.25	2.77
3-in. nut	2.00	2.52
Staunton or Mt. Olive:		
6-in. lump	1.50	2.02
2-in. lump	1.25	1.77
Mine-run	1.20	1.72
Screenings	0.60	1.12
Carterville:		
6-in. lump or egg	1.30	1.97
3-in. nut	1.20	1.87
Mine-run	1.10	1.77
Screenings	0.75	1.42
Pocahontas and New River:		
Lump or egg	2.25	4.75
Mine-run	1.25	3.75
Pennsylvania Anthracite:		
Chestnut	....	7.20
Stove or egg	....	6.95
Grate	....	6.70
Coke:		
Connellsville foundry	....	5.40
Gas house	....	4.90
Smithing	....	4.15

Prices at East St. Louis are 20c. per ton below the St. Louis quotations.

Anthracite—The market for this season is, of course, at a standstill, though there is a good deal of activity in lining up business for April delivery.

FOREIGN·COAL·TRADE

United States Coal Exports—Exports of coal from United States ports, with coal furnished to steamships in foreign trade, month of January, long tons:

	1910.	1911.	Changes.
Anthracite	215,313	251,737	I. 36,424
Bituminous	511,316	740,974	I. 229,658
Total exports	726,629	992,711	I. 266,082
Steamer coal	457,205	481,467	I. 24,262
Total	1,183,834	1,474,178	I. 290,344
Coke	70,768	87,578	I. 16,810

Canada took this year 718,299 tons of coal, or 72.3 per cent. of the total. The coke went chiefly to Canada and Mexico. Cuba and the West Indies took 128,502 tons of coal.

United States Coal Imports—Imports of bituminous coal and coke into the United States, month of January, long tons:

	1910.	1911.	Changes.
Coal	141,478	144,457	I. 2,979
Coke	13,501	13,157	D. 344
Total	154,979	157,614	I. 2,635

Anthracite imports are not reported; they amount to only a few tons. Canada supplied this year 324,592 tons of coal and nearly all the coke; Australia, 9562 tons coal; Japan, 16,853 tons of coal. Imports are chiefly on the Pacific Coast and in the border States of the Northwest.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of coal on Feb. 25, as follows: Best Welsh steam coal, $4.26; seconds, $4.08; thirds, $3.90; dry coal, $3.96; best Monmouthshire, $3.84; seconds, $3.66; best small steam coal, $2.34; seconds, $2.10. All prices are per long ton, f.o.b. shipping port, cash in 30 days less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, March 8—The iron and steel trades seem to have recovered from the so-called shock of the railroad-rate decision. That effect, after all, was mainly sentimental, and it does not look as if it was going to have any serious or practical influence, even on railroad buying. The markets, however, continue rather quiet. There is, taking it altogether, a large volume of business, but there is no rush and no unusual activity.

In pig iron there is quite a business reported in basic in the Central West. In foundry iron sales have been made both in the West and in Seaboard territory, chiefly in moderate quantities. Buyers and sellers are still apart on prices for second-half deliveries. There are plenty of inquiries on such business, but very little business reported.

In finished material orders are reported placed for quite a range of products and many mills are increasing

their activity. Some good contracts for structural steel are forward, and the spring building business looks well. The railroads are placing some orders for bridge material and equipment, and a few for rails. The Steel Corporation, it is reported, has secured an order for 45,000 tons of rails for South America and a smaller order for Japan.

The expected advance on wire has materialized; it amounts to $1 per ton. Other prices on finished materials appear to be well held.

Baltimore

March 6—Exports for the week included 3,942,800 lb. steel billets to Liverpool; 1,593,794 lb. miscellaneous iron and steel to Panama. Imports included 5000 tons manganese ore from India; 6300 tons iron ore from Cuba; 5314 tons cupreous pyrites from Huelva, Spain.

Birmingham

March 6—The Southern iron market is a little stronger right now than it has been at any time this year, though the sales during the past week were not as active as they were during the latter part of February. Iron prices have strengthened up as inquiries for the product for delivery during the last half of the year start in. The producers appear to be unwilling to sell iron for such delivery at present quotations. While a number of inquiries have been received for iron for future delivery the statement is made there have been few sales yet for the last half. There has been no improvement in the make in the Southern territory. The accumulated stocks of iron show considerable decrease, but there is still a large quantity to be moved out. The consumption in the home territory is picking up.

The steel trade is growing better. The announcement is made of another good order for steel rails placed by a Southern railroad during the past week.

The scrap-iron market in the Southern territory is improving steadily.

The cast-iron pipe conditions also show improvement. There are some good contracts pending which promise to result in business.

Chicago

March 6—Sales of pig iron are increasing and prices are firm at $11 Birmingham for No. 2 Southern ($15.35 Chicago) and $15.50@16 for Northern No. 2, in both cases on second-quarter deliveries. Some sales are for the third quarter or last half; nearly all, however, are for second quarter yet. The sale of railroad supplies neither increases nor falls off notably, showing little effect from the rate decision. Structural material is in large demand and the agricultural-implement makers are buying liberally of bars. Inquiries indicate that a large tonnage of pig iron must be supplied soon for last-half needs, and the outlook is regarded as encouraging by leading pig-iron agents. Coke continues dull with Connellsville at $4.70, Chicago.

Cleveland

March 6—Ore seems to be moving from the docks rather slowly, and there will be large stocks left on May 1, to all appearances.

Pig Iron—Business has been rather quiet, though inquiries continue to come in. Prices are unchanged, quotations for Cleveland delivery being $15.90 for bessemer, $14.40 for basic, $14.25 for No. 2 foundry and $13.75 for forge.

Finished Material—A fair business continues in sheets, plates and bars; also in nails and wire products.

Philadelphia

March 8—Special interest is felt this week in basic pig and some transactions which have been hanging fire for several weeks will now go through. The only uncertainty is as to the amount of business that will be closed and the date of the later deliveries.

The impression prevails that basic iron has seen its lowest, but there is a hesitancy shown by buyers as to how much iron they will take, as well as on the part of the sellers as to how far they will bind themseves at present prices. While foundry irons are firmer the sales which have been definitely closed cover only small lots. Sales of pipe iron are large and at previous quotations. Sales of forge iron are trifling and at recent figures. The improvement in outside markets is only faintly represented here. Southern irons are persistently offered without much result, owing to the trifling difference in cost under local brands. There is a nominal advance of 50c., which is likely to become an actual advance on all future transactions. Sales of No. 2 foundry are being made at $15.75, forge at $14.50, with $15@15.50 for basic.

Steel Billets—Billets have nominally advanced 50c., with light sales for near delivery. Forging billets have a steady sale and agents report a larger consumption throughout Eastern territory.

Bars—Manufacturers report a somewhat freer movement with the approach of spring, but with ample assortments at mills there is no occasion for any larger output. There are no concessions and only an occasional order.

Sheets—The only bright spot is in the closing of orders of fair proportions for galvanized sheets for spring construction work. Other lines are quiet though the aggregate of weekly sales is fully maintained.

Pipes and Tubes—Merchant pipe has advanced slightly and the first actual improvement is now being felt. Cast-iron pipe is strong and enough new business is coming along to keep the foundries busy.

Plates—The only business for the past week consisted of small lots mainly for construction work and for early delivery. Manufacturers admit that early delivery orders have been disappointing; yet the aggregate in sight is by no means small.

Structural Material—This week's business is made up of quite a string of small orders for bridge work for some Eastern railroads and for construction work in Eastern cities between Boston and Baltimore.

Rails—Further inquiries for mine rails for April or May delivery are a feature of this week.

Scrap—The local market is dull after two or three weeks of activity. Heavy supplies of Panama scrap will, in due time, reach this market and will be immediately disposed of; in fact, a market has already been found for it. Small lots of old iron rails and old car wheels have been sold to be delivered early in April.

Pittsburg

March 7—While there are efforts to make it appear that the iron and steel market is unchanged or has actually improved in the past fortnight, it seems perfectly certain that the market has grown quieter, and has been less active than early in February. The February total of business, of course, makes a favorable comparison with the January total, because January was a month of improvement rather than of great total activity. Prices of steel products are well held, and there is no room for complaint on that score, but the rate of buying has decreased, and buyers show no indication of being about to come into the market with larger business.

Effective at the opening of business, March 6, wire products were advanced $1 per ton, making plain wire 1.60c., base; wire nails, $1.80, base; painted barb wire 1.80c., and galvanized barb wire 2.10c. The previous advance, also $1 a ton, became effective Jan. 23, so that $2 of the $3 per ton lost last spring and summer has been regained. The January advance was made to stimulate specifications on existing contracts, which had been largely rewritten to bring them uptodate, the trade custom being to permit specifications for 60 days on a contract. At the advanced price fresh contracts were written and the question is whether the present advance will bring out specifications on those. The jobbers have been taking material very well since the January advance, but the distribution has been poor, the retailers taking little material, so that it is questionable whether the jobbers will take on much more material.

An advance of one point, or $2 a ton, in merchant steel pipe is imminent, but

may not occur until April 1. It also would be for the purpose of stimulating specifications. The jobbers are practically bare of stocks and by writing up fresh contracts with them and then advancing the price some good tonnage might be developed.

Pig Iron—The bessemer market has been quiet. Since the 1000-ton sale reported last week, 200 tons have been sold at $15, Valley, the regular price. An interest in the market for a round tonnage could do no better than $15, and took an option on 7000 or 8000 tons, good until early this week, but gave the option up. Basic iron has been quiet, and the market is quotable on the basis that the last sales were made at $13.75, Valley, while the minimum asking price of furnaces is $14, and there is considerable iron in middlemen's hands, prices on which will only be made as definite inquiries appear. The bessemer average for February, compiled from actual sales, was $15, Valley, there having been practically no change since last August. The basic average, compiled on a similar basis, was $13.603, Valley, against $13.291 for January and $13.15 for October, the low month on the movement. Foundry iron is somewhat more active, the Pressed Steel Car Company having taken about 1500 tons of foundry and carwheel iron, while the Union Switch and Signal Company is inquiring for 1000 tons for second-half and the Standard Steel Car Company for 1000 tons for early delivery. An interesting development is the inquiry of the Standard Sanitary Manufacturing Company for 1000 tons of Southern iron for delivery over the four months to its New Brighton plant, near Pittsburg. This iron will cost more than $1 in excess of local iron. Several years ago, when it came about that Southern iron could no longer be delivered to the Pittsburg district on even terms with Northern iron, the use of Southern was discontinued. It is suggested that the higher phosphorus in Southern iron is required, by reason of Northern irons going down in phosphorus of late. We quote local foundry iron at $14 at furnace, or $14.75@14.90, delivered Pittsburg, a premium of 25c. being sometimes obtained on small lots of particular brands.

Ferromanganese—The market continues quiet, with prompt quotable at $37.50@37.75, and forward at $38, Baltimore, freight to Pittsburg being $1.95 per ton.

Steel—The market is quiet but firm, billets being $23 and sheet bars $24, bessemer or open-hearth, Pittsburg or Youngstown. Rods are $29, but it is possible an advance will be made on account of this week's advance in wire.

Sheets—The market is perhaps quieter than it was as regards the mills, but jobbers have been doing better business in the past fortnight. Prices are well held at 2.20c. for black, 3.20c. for galvanized, 1.65c. for blue annealed, $1.55 for painted corrugated and $2.75 for galvanized corrugated.

St. Louis

March 6—The pig-iron market has been quiet, though a number of small orders have been received and several fair-sized inquiries. Most of the business done is for second-quarter delivery, though a few are venturing into the third quarter. The price of $11 per ton Birmingham or $14.75 St. Louis, is the prevailing one for No. 2 foundry. There have also been some calls for Northern iron this week.

San Francisco

March 1—Two recent incidents in the local market have been the offering of pig iron made in the electric furnace at Heroult, Cal.; and the arrival of 500 tons of iron from China. The Heroult pig is held at $25 per ton, f.o.b. San Francisco. The Chinese iron is offered at $23@23.50. These prices compare with $22 for English pig, and $21@21.50 for Alabama foundry.

METAL MARKETS

New York, March 8—The metal markets continue rather quiet for the most part, with few changes from the last reports.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Jan. 1911..	$ 921,360	$ 9,540,830	Imp.$ 8,619,470
" 1910..	6,163,132	2,131,357	Exp. 4,031,775
Year 1911..	921,360	9,540,830	Imp. 8,619,470
" 1910..	6,163,132	2,131,357	Exp. 2,131,357
Silver:			
Jan. 1911..	5,651,076	3,551,426	Exp. 2,099,650
" 1910..	4,498,304	4,248,354	" 249,980
Year 1911..	5,651,076	3,551,426	" 2,099,650
" 1910..	4,498,304	4,248,354	" 249,980

Exports from the port of New York, week ended March : Gold, $189,825; silver, $891,306, chiefly to London. Imports: Gold, $154,098; silver, $157,773, principally from Mexico, Central and South America.

Gold—The price of gold on the open market in London was unchanged, at 77s. 9d. per oz. for bars and 76s. 4½d. per oz. for American coin. The Bank of England took nearly all the gold arriving during the week.

Platinum—Business is steady and prices unchanged. Dealers ask $41 per oz. for refined platinum; $43.50@44 for hard metal, 10 per cent. iridium.

Our Russian correspondent writes, under date of Feb. 16, that the market is quiet, and prices about the same. Small lots at Ekaterinburg bring 8.50 rubles per zolotnik—$31.96 per oz.—for crude metal, 83 per cent. platinum. Large lots at St. Petersburg are 32,300@32,500 rubles per pood—$31.75 per oz., average. It is reported that the largest English dealers in platinum have submitted a proposal to the government, offering to erect a refinery for platinum produced in Russia.

Silver—The market has moved within narrow limits the past week—24 7/16 and 24¼d. in London—closing steady at 24⅜d. on buying by China banks.

SILVER AND STERLING EXCHANGE

Mar.	2	3	4	6	7	8
New York....	53	52¾	52⅝	52⅝	52⅝	52⅞
London..	24⅜	24⅜	24⅜	24⅜	24⅜	24⅜
Sterling Ex..	4.8635	4.8635	4.8640	4.8635	4.8640	4.8640

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Shipments of silver from London to the East, Jan. 1 to Feb. 23, as reported by Messrs. Pixley & Abell:

	1910.	1911.	Changes.
India.....	£1,173,900	£1,482,700	I. £308,800
China.....	257,000	406,000	I. 149,000
Total.....	£1,430,900	£1,888,700	I. £457,800

India Council bills in London brought an average of 16.09d. per rupee for the week.

Copper, Tin, Lead and Zinc

NEW YORK

Mar.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. New York, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
2	12⅜ @12⅜	12 15 @12 25	41¼	4.37½ 4.40	4.22½ @4.25	5.62½ @5.67½	5.47½ @5 52½
3	12⅜ @12⅜	12.15 @12.25	40	4.37½ 4.40	4.22½ @4.25	5.62½ @5.67½	5.47½ @5.52½
4	12⅜ @12⅜	12.15 @12.25	40	4.37½ 4.40	4.22½ @4.25	5.62½ @5.65	5.47½ @5.50
6	12⅜ @12⅜	12.15 @12.20	39¾	4.37½ 4.40	4.22½ @4.25	5.62½ @5.65	5.47½ @5.50
7	12⅜ @12⅜	12 15 @12.20	39	4.37½ 4.40	4.22½ @4.25	5 60 @5.65	5.45 @5.50
8	12⅜ @12⅜	12 15 @12 20	40⅜	4.37½ 4.40	4.22½ @4 25	5.60 @5 65	5.45 @5.50

The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The market is dull and featureless. Manufacturers in this country are covered for the time being, and in view of the political developments have not been disposed to buy ahead. The demand from Europe has also been small, and the market has been more or less nominal. Electrolytic copper has been freely offered at 12⅜c., delivered, usual terms, and the transactions that have been consummated have been at concessions. The reports that sales have

LONDON

Mar.	Copper. Spot.	Copper. 3 Mos	Copper. Best Sel'td	Tin. Spot.	Tin. 3 Mos	Lead, Spanish.	Zinc, Ordinaries.
2	54⅜	55 5/16	58¾	189	183¾	13¼	23
3	54½	55 5/16	58½	181	178¼	13¼	23
4	.....	.....	.....	.....	.....	.....	.....
6	54 5/16	55	58¼	180	177½	13¼	23
7	54⅜	55 1/16	58¼	177½	177½	13¼	23
8	54⅜	55 1/16	58¾	183½	183	13¼	23

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £12 = 2.61c.; £23=5c.; £60 = 13.04c. ± £1 = ± 0.21¾c.

been made at 12¼c., delivered, etc., do not, however, seem to be well founded. Lake copper has been easily obtainable at 12½c., but little business in it is reported. At the close we quote Lake copper at 12⅜@12⅝c., and electrolytic copper in cakes, wirebars and ingots at 12.15 @12.20c. Casting copper is quoted nominally at 11⅞@12 cents.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 13½c. base, carload lots at mill.

The London standard market has fluctuated within narrow limits. It declined about 5s. early this week, which it recovered again today and closes at £54 17s. 6d. for spot, and £55 11s. 3d. for three months.

Copper exports from New York for the week were 5988 long tons. Our special correspondent gives the exports from Baltimore for the week at 2065 tons.

The United Verde company in 1910 produced and sold 38,663,800 lb. of copper, realizing an average of 12.69c. per lb. for the metal.

Tin—The liquidation of the syndicate members continued, with the effect that the market declined considerably. In view of the firmness of future tin, in comparison to spot, it seems as though some swapping of positions was indulged in by somebody, namely, getting rid of spot tin and replacing it by three months tin. With the decline, transactions increased in volume. At this writing, the market has turned and has again become very strong, closing at £183 10s. for spot, and £183 for three months.

The severe decline in London put an end to the corner of spot tin in this market, which can now be purchased at only a slight advance over the import price. At the lower prices, a good deal more interest was shown by consumers, who have bought more liberally than for some time past. March tin is quoted at about 40⅝ cents.

Visible stocks of tin on March 1, including tin afloat were: London, 10,800; Holland, 1490; United States, excluding Pacific ports, 4970; total, 17,260 long tons, a decrease of 1356 tons from the Feb. 1 report. Stocks on March 1 included 9149 tons in store and 8111 tons afloat.

Lead—The market is quiet. The better demand for lead which usually makes itself felt early in the spring has not as yet set in. At St. Louis lead is quoted at 4.22½@4.25c., and at New York 4.37½ @4.40 cents.

The London market for Spanish lead is unchanged at £13 5s. and £13 7s. 6d. for English.

Spelter—There has been a fair demand for spelter, due to the fact that the galvanizing business is improving and buyers are not well covered. The demand, however, has been freely met, and somewhat lower prices have been accepted. At the close, the market is quoted at 5.45@5.50c. St. Louis, and 5.60 @5.65c. New York.

The London market for good ordinaries is unchanged at £23, and £23 5s for specials.

Base price of zinc sheets is $7.50 per 100 lb., f.o.b. La Salle-Peru, Ind., less 8 per cent. discount.

Other Metals

Aluminum—Some sales are reported at 21c. and a little over. We quote 21@ 21½c. per lb. for No. 1 ingots, New York. Abroad the current quotation is about 14c. per lb. for the same grade.

Antimony—The market is rather unsettled, and only a light business has been transacted. Cookson's is quoted at 9½ @9⅝c. per lb. Representatives of the combination abroad quote 8¾@9¼c. per lb. for Hungarian and all other outside brands.

Quicksilver—The situation remains about as reported last week. The market is bare of supplies, and present demand cannot be satisfied. In New York a quotation of $52 per flask is given, but it is entirely nominal, as none is offered for sale. Jobbers quote $56@57 for small lots. San Francisco price is $51 for domestic and $2 less for export. The London price is now £10 per flask, with £9 15s. quoted by jobbers.

Bismuth—The current price of bismuth in London is 7s. 6d.—or $1.80—per lb. This price has been maintained for several months.

Cadmium—Current quotations are 60 @70c. per lb. in 100-lb. lots, f.o.b. New York, according to quantity of metal. The price in Germany has recently advanced and is now 575@600 marks per 100 kg.; equal to 63.4c. per lb., average.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots up to 55c. for 200-lb. lots. The price of electrolytic is 5c. higher.

Imports and Exports of Metals

Exports and imports of metals in the United States, 12 months ended Dec. 31, are reported as follows, in the measures usual in the trade:

Metals:	Exports.	Imports.	Excess.
Copper, long tons	28,922	10,726	Exp. 18,196
Copper, 1910....	30,097	14,000	Exp. 16,000
Tin, long tons....	40	4,139	Imp. 4,099
Tin, 1910.....	33	4,976	Imp. 4,943
Lead, short tons.	3,197	6,517	Imp. 3,320
Lead, 1910.....	3,201	10,631	Imp. 7,430
Spelter, sh. tons.	1,306	265	Exp. 1,041
Spelter, 1910....	262	563	Imp. 301
Nickel, lb.....	2,165,541	2,429,336	Imp. 263,795
Nickel, 1910....	1,119,945	2,464,941	Imp. 1,344,996
Antimony, lb.....	127,644	601,046	Imp. 473,402
Antimony, 1910.	.....	730,328	Imp. 730,328
Platinum, oz.....	.....	5,926	Imp. 5,926
Platinum, 1910.	31	7,039	Imp. 7,001
Aluminum, value	$107,322	.....	Exp. $107,328
Aluminum, 1910	27,131	.....	Exp. 27,132
Ores, etc.:			
Zinc oxide, lb. ..	2,468,630	.....	Exp. 2,468,430
Zinc oxide, '10..	1,677,329	.....	Exp. 1,677,329
Zinc dross, lb....	479,887	.....	Exp. 479,877
Zinc dross, '10..	161,501	.....	Exp. 161,501
Zinc ores, lg.tons	1,490	6,337	Imp. 4,847
Zinc ores, 1910.	2,020	5,139	Imp. 3,119
Chrome ore, tons	.....	7,903	Imp. 7,903
Chrome ore, '10	.....	3,740	Imp. 3 740

Copper, lead, nickel and antimony include the metal contents of ores, matte, bullion, etc. Quantity of antimony ore is not reported. Imports of aluminum are not given. The exports given above include reëxports of foreign material. Zinc contents of ores imported were 3,917,114 lb. in 1910, and 5,263,407 lb. this year.

Zinc and Lead Ore Markets

Platteville, Wis., March 4—The base price paid this week for 60 per cent. zinc ore was $42@42.50. The base price paid for 80 per cent. lead ore was $54@55 per ton.

SHIPMENTS, WEEK ENDED MAR. 4.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point.....	769,100	.....	.....
Galena.....	719,400	.....	.....
Platteville.....	689,910	.....	298,800
Harker	230,010	.....	.....
Benton.....	172,000	.....	.....
Hazel Green.....	84,300	103,700	.....
Cuba City.....	85,965	.....	227,000
Highland.....	39,400	.....	.....
Linden.....	.....	.....	60,000
Montfort.....	.....	38,585	.....
Total.....	2,790,085	142,285	585,800
Year to date.....	24,365,290	1,531,535	7,069,230

Shipped during week to separating plants, 3,291,270 lb. zinc ore.

Joplin, Mo., March 4—The highest price paid for zinc sulphide ore was $47 the assay base price ranging from $39 to $43.50 per ton of 60 per cent. zinc. Zinc silicate ore sold at $20@24 per ton of 40 per cent. zinc. The average price, all grades of zinc, was $38.76 per ton. The highest price at which lead ore was quoted was $55.50, the bulk of ore selling at $55 and $54.50. The average price, all grades of lead, was $54.74 per ton.

The market was exceptionally strong for the better grades of ore, advancing $1 over the previous week, but medium grades were pushed no higher, with a tendency at the week-end, among buyers, to make lower offerings on purchases for next week's delivery. Weather conditions continue favorable for outputting and buying is still under the weekly production.

SHIPMENTS, WEEK ENDED MAR. 4.

	Zinc lb.	Lead lb.	Value.
Webb City-Carterville	4,122,360	682,310	$103,271
Joplin	1,561,590	213,480	38,610
Granby	1,499,720	29,210	22,670
Alba-Neck	601,850	.....	13,842
Galena	512,890	96,080	12,946
Oronogo	576,300	.....	11,655
Duenweg	356,590	88,030	8,495
Carthage	234,410	.....	4,805
Spring City	245,960	26,270	4,498
Aurora	279,110	.....	4,020
Badger	124,340	4,730	2,675
Quapaw	124,300	.....	2,362
Jackson	64,200	.....	1,284
Cave Springs	56,760	.....	1,163
Miami	60,440	.....	755
Totals	10,420,820	1,134,110	$233,051
9 weeks	85,783,950	15,307,160	$2,125,033

Zinc value, the week, $202,000; 9 weeks, $1,700,741
Lead value, the week, 31,051; 9 weeks, 424,292

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1910.	1911.	1910.	1911.	1910.	1911.
January	$47.31	$41.85	$45.16	$40.55	$56.99	$55.68
February	40.69	40.21	39.47	39.16	53.64	54.46
March	43.60	.....	39.71	.....	51.26	.....
April	41.00	.....	39.33	.....	49.72	.....
May	40.19	.....	37.51	.....	48.16	.....
June	40.20	.....	37.83	.....	48.80	.....
July	39.63	.....	36.80	.....	48.59	.....
August	40.13	.....	37.32	.....	49.75	.....
September	43.45	.....	39.96	.....	54.73	.....
October	43.31	.....	40.50	.....	53.18	.....
November	47.20	.....	43.29	.....	54.80	.....
December	42.50	.....	40.70	.....	55.70	.....
Year	$42.43	.....	$39.79	.....	$52.12	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, March 8—The chemical markets generally are quiet and only moderate business is reported in most lines.

Copper Sulphate—Sales have been fair only, and quotations are unchanged at $4 per 100 lb. for carload lots and $4.25 per 100 lb. for smaller parcels.

Arsenic—The market remains dull and rather overstocked. Quotations continue at $2 per 100 lb. for white arsenic, with no prospect of an advance, as long as the present relations of supply and demand continue.

Nitrate of Soda—Business is more active than it has been. Quotations continue 2.10c. per lb. for both spot and futures; but there is a firmer tone to the market.

Potash Salts—In the effort to find some way of lessening the dependence of the United States upon Germany as a source of supply of potash, the Geological Survey has been granted an appropriation of $20,000 by Congress to prospect for potash deposits on the public lands of the United States. At the same time, the Bureau of Soils of the Survey has been granted $12,500 to see whether it can find any way of extracting potash from other minerals now available. The Survey authorities state that they will place prospecting parties in the field shortly with instructions to visit the most likely places and, if possible, locate some potash deposits. On the other hand, the Bureau of Soils has worked out a plan of procedure and this has been discussed by the chief of the bureau with Secretary of Agriculture Wilson. The plan has not been made public in detail.

Imports and Exports—Imports and exports of chemicals and raw materials in the United States, month of January:

	Imports.	Exports.		Excess.	
Copper sulph. lb.	.....	1,137,105	E.	1,137,105	
Copper sul., '10	.....	897,290	E.	897,290	
Bleach, lb.	8,880,365	.....	I.	8,880,356	
Bleach, 1910	8,060,347	.....	I.	8,060,347	
Potash salts, lb.	88,558,067	100,000	I.	88,458,067	
Potash salts, '10	50,776,100	66,078	I.	50,710,022	
Soda salts, lb.	4,177,218	90,180	I.	4,087,038	
Soda salts, 1910	1,538,810	59,274	I.	1,479,586	
Acetate lime, lb.	.....	2,371,804	E.	2,371,804	
Acetate, 1910	.....	4,215,046	E.	4,215,086	
Nit. of soda, tons	61,351	857	I.	60,494	
Nitrate, 1910	32,907	1,151	I.	31,756	
Phosphates, tons	.....	61,376	E.	61,376	
Phosphates, '10	.....	29,603	E.	29,603	
Sulphur, tons	1,799	101	I.	1,698	
Sulphur, 1910	4,011	11,414	E.	7,403	
Pyrites, tons	104,287	.....	I.	104,287	
Pyrites, 1910	70,415	.....	I.	70,415	
Magnesite, lb.	26,241,563	.....	I.	26,241,563	
Magnesite, 1910	18,596,048	237,590	I.	18,358,458	
Sul. ammonia, lb.	46,441,563	.....	I.	46,441,563	
Sul. am'nia, '10	22,941,691	.....	I.	22,941,691	
Arsenic, lb.	495,372	.....	I.	495,372	
Arsenic, 1910	828,872	221	I.	828,651	

Exports include reëxports of foreign material. Estimating sulphur contents of pyrites, the total imports of sulphur this year were 43,514 tons.

MINING·STOCKS $

New York, March 8—A slow market and narrow fluctuations have been the rule in the general stock markets. There is some apprehension in Wall Street over the extra session of Congress, and the public does not seem to be taking much interest.

On the Curb, also, there was a slow market and small fluctuations. The copper stocks moved only by small fractions and sales were limited. The Cobalt stocks were more active and generally firm in price. Trading generally was light for the week.

Boston, March 7—There has been little to attract attention in this market. Copper shares remain dull at the low levels. The uncertainty of the Wall Street market has served to detract from coppers, although this market is influenced more or less by the fluctuations in New York.

The first series of the special meetings of the Calumet & Hecla and subsidiary companies occurred today, but they were not market features and had no effect on the prices of any of the stocks. Calumet & Hecla practically has proxies for all of the Michigan companies, and it now looks as if everything would go through as originally planned. Osceola minority stockholders will probably put up a fight, as former superintendent Uren and other Lake Superior interests are now in this city to attend the meet-

COPPER PRODUCTION REPORTS.
Copper contents of blister copper, in pounds.

Company.	December.	January.	February.
Anaconda	21,500,000	21,000,000	20,900,000
Arizona, Ltd.	3,224,000	3,024,000	2,860,000
Balaklala	160,000	932,452	.....
Copper Queen	.....	7,298,227	.....
Calumet & Ariz.	1,900,000	2,044,000	.....
Detroit	.....	2,017,397	.....
East Butte	870,812	1,134,000	.....
Imperial	.....	.....	.....
Mammoth	.....	.....	.....
Nevada Con.	5,510,936	5,268,954	.....
Old Dominion	2,287,000	2,095,000	.....
Shannon	.....	1,250,000	1,166,000
Superior & Pitts.	2,175,000	2,014,000	.....
United Verde*	.....	3,000,000	.....
Utah Copper Co.	7,137,585	6,707,116	.....
Lake Superior*	20,000,000	15,700,000	.....
Non-rep. mines*	13,100,000	.....	.....
Total production	.....	.....	.....
Imports, bars, etc.	25,192,854	18,648,920	.....
Total blister	.....	.....	.....
Imp. in ore & matte	9,316,091	5,377,700	.....
Total	.....	.....	.....
Brit. Col. Cos.:			
British Col. Copper	.....	.....	.....
Granby	1,645,613	.....	.....
Mexican Cos.:			
Boleo	2,766,630	2,647,173	.....
Cananea	.....	.....	3,906,000
Moctezuma	.....	1,738,429	.....

Figures are reports received from companies, unless otherwise stated. Boleo copper does not come to American refiners.
*Estimated.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
II, 1910	112,712,493	66,618,322	37,369,518
III	120,067,467	62,844,818	40,585,767
IV	117,477,639	67,985,951	31,332,434
V	123,242,476	59,305,222	45,495,400
VI	127,219,188	53,363,196	65,895,948
VII	118,370,003	56,708,175	59,407,167
VIII	127,803,618	67,731,271	61,831,780
IX	119,519,983	64,501,018	75,106,496
X	126,469,284	67,814,172	68,186,912
XI	119,353,463	60,801,992	67,424 316
XII	123,339,219	43,594,018	88,104,075
Year 1910	1,452,122,120	749,426,542	722,431,494
I, 1911	115,696,591	42,078,567	53,208,739
II	109,828,297	50,518,998	45,111,019

VISIBLE STOCKS.

	United States.	Europe.	Total.
III, 1910	107,187,992	254,150,400	361,338,392
IV	123,824,874	249,625,600	373,450,474
V	141,984,159	246,870,400	388,854,559
VI	160,425,973	239,142,400	399,568,373
VII	168,386,017	232,892,800	401,278,818
VIII	170,640,678	222,320,000	392,960,677
IX	168,881,245	218,444,800	387,326,045
X	148,793,714	211,276,800	360,070,514
XI	139,261,914	198,060,800	337,322,714
XII	130,389,069	193,200,000	323,589,069
I, 1911	122,030,195	187,797,120	309,827,315
II	142,439,490	186,368,000	328,807,490
III	156,637,780	184,553,600	341,191,380

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

ing on March 9. A compromise may be reached with these interests by giving them representation on the board.

Stocks in general are about parallel with the lowest of the year. Some inspiration was given by the declaration of the usual $5 dividend by the Wolverine Mining Company. Calumet & Arizona mining directors have also declared the usual $1 dividend. Superior & Pittsburg stockholders receive an 86c. dividend, but as a majority of the stock has been turned in for exchange into Calumet & Arizona, it does not cut much of a figure.

Curb trading has been light and of little importance.

United Verde Extension had a break to $1.50 on profit taking.

Assessments

Company.	Delinq.	Sale.	Amt.
Aeolian, Ida	Mar. 1	Mar. 18	$0.005
Albion, Utah	Feb. 23	Mar. 27	0.13
Cedar Creek, Ida	Apr. 1	May 1	0.002
Eastern Star, Ida	Mar. 4	Apr. 4	0.002
Emma, Utah	Mar. 15	Apr. 10	0.005
Florence M. & M., Ida	Feb. 20	Mar. 20	0.001
Giant, Ida	Feb. 27	Mar. 27	0.003
Hancock Con., Mich	May 1		1.00
Helvetia Copper, Ariz	Feb. 15		0.50
Ida. Copper, Ida	Mar. 10	Apr. 8	0.003
Independence, Utah	Mar. 9	Mar. 25	0.007
Mineral Farm, Ida	Mar. 9	Apr. 15	0.003
Missoula Copper, Ida	Mar. 13	Apr. 5	0.005
Lower Mammoth, Utah	Feb. 11		0.05
Lucky Swede, Ida	Apr. 1	May 1	0.002
Rexall, Utah	Feb. 18	Mar. 20	0.005
Savage, Nev	Mar. 15	Apr. 5	0.10
Savanna, N. M	Mar. 1		0.50
Seg. Belcher, Nev	Mar. 14	Apr. 5	0.05
Selma, Utah	Feb. 15	Mar. 15	0.00½
Silver Crown, Ida	Mar. 21	Apr. 21	0.001
Sunrise, Ida	Feb. 18	Mar. 11	0.003
Super'r & Boston Cop., Ariz.	Feb. 20		1.00
Tonopah North Star, Nev			0.03
Trans.-Continental, Ida	Mar. 1	Apr. 1	0.002
Wabash, Utah	Mar. 27	Apr 20	0.10

Monthly Average Prices of Metals

SILVER

Month.	New York.			London.		
	1909.	1910.	1911.	1909.	1910.	1911.
January	51.750	52.375	53.795	23.843	24.154	24.865
February	51.472	51.534	52.222	23.706	23.794	24.081
March	50.468	51.454		23.227	23.690	
April	51.428	53.221		23.708	24.483	
May	52.905	53.870		24.343	24.797	
June	52.538	53.462		24.166	24.651	
July	51.043	54.150		23.519	25.034	
August	51.125	52.912		23.588	24.428	
September	51.440	53.295		23.743	24.567	
October	50.923	55.490		23.502	25.596	
November	50.703	55.635		23.351	25.680	
December	52.226	54.428		24.030	25.160	
Total	51.502	53.486		23.706	24.670	

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	New York.				London, Standard.	
	Electrolytic		Lake.			
	1910.	1911.	1910.	1911.	1910.	1911.
January	13.620	12.295	13.870	12.680	60.923	55.604
February	13.332	12.256	13.719	12.611	59.388	54.970
March	13.255		13.586		59.214	
April	12.733		13.091		57.238	
May	12.550		12.885		56.313	
June	12.404		12.798		55.310	
July	12.215		12.570		54.194	
August	12.490		12.715		55.733	
September	12.379		12.668		55.207	
October	12.553		12.788		56.722	
November	12.742		12.914		57.634	
December	12.581		12.863		56.769	
Year	12.738		13.039		57.054	

TIN AT NEW YORK

Month.	1910.	1911.	Month.	1910.	1911.
January	32.700	41.255	July	32.695	
February	32.920	41.614	August	33.972	
March	32.403		September	34.982	
April	32.976		October	36.190	
May	33.125		November	36.547	
June	32.769		December	38.199	
			Av. Year	34.123	

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1910.	1911.	1910.	1911.	1910.	1911.
January	4.700	4.483	4.582	4.334	13.650	13.009
February	4.613	4.440	4.445	4.266	13.328	13.043
March	4.459		4.307		13.063	
April	4.376		4.225		12.641	
May	4.315		4.164		12.550	
June	4.343		4.207		12.688	
July	4.404		4.291		12.531	
August	4.400		4.290		12.513	
September	4.400		4.289		12.582	
October	4.400		4.271		13.091	
November	4.442		4.314		13.217	
December	4.500		4.363		13.197	
Year	4.446		4.312		12.920	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1910.	1911.	1910.	1911.	1910.	1911.
January	6.101	5.452	5.951	5.302	23.350	23.887
February	5.569	5.518	5.419	5.368	23.188	23.276
March	5.637		5.487		23.031	
April	5.439		5.289		22.469	
May	5.191		5.041		22.100	
June	5.128		4.978		22.094	
July	5.152		5.002		22.406	
August	5.279		5.129		22.800	
September	5.514		5.364		23.165	
October	5.628		5.478		23.900	
November	5.976		5.826		24.083	
December	5.624		5.474		24.019	
Year	5.520		5.370		23.050	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1910.	1911.	1910.	1911.	1910.	1911.
January	$19.90	$15.90	$17.98	$14.40	$17.94	$14.75
February	18.96	15.90	17.21	14.50	17.38	14.81
March	18.53		16.93		17.00	
April	18.28		16.84		16.75	
May	17.10		15.94		16.18	
June	16.52		15.60		15.53	
July	16.40		15.40		15.40	
August	16.09		14.89		15.16	
September	15.92		14.73		14.93	
October	15.90		14.05		14.88	
November	15.84		14.26		14.78	
December	15.90		14.15		14.65	
Year	$17.10		$15.65		$15.83	

STOCK QUOTATIONS

COLO. SPRINGS Mar. 7

Name of Comp.	Bid.
Acacia	.04
Cripple Cr'k Con.	.01
C. K. & N.	.14
Doctor Jack Pot.	.07½
Elkton Con.	.64½
El Paso	.71
Findlay	.06
Gold Dollar	‡.13
Gold Sovereign	.02
Isabella	.16½
Jack Pot	‡.06
Jennie Semple	.10
Lexington	.03½
Moon Anchor	.03½
Old Gold	‡.03
Mary McKinney	‡.44
Pharmacist	.02½
Portland	1.05
Vindicator	.89
Work	.03

SALT LAKE Mar. 7

Name of Comp.	Bid.
Beck Tunnel	.26
Black Jack	.13
Carisa	.18
Cedar Talisman	.10
Colorado Mining	.61
Columbus Con.	.10
Daly Judge	5
Grand Central	.92
Iron Blossom	1.32½
Little Bell	.48
Lower Mammoth	.11
Mason Valley	8
May Day	.18
Nevada Hills	2⅜
New York	‡.15½
Prince Con	.65
Silver King Coal'n	1.65
Sioux Con.	¾
Uncle Sam	.69
Yankee	.13½

SAN FRANCISCO. Mar. 7.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Alta	‡.05
Belcher	.50
Best & Belcher	.27
Caledonia	.31
Challenge Con.	.08
Chollar	.14
Confidence	‡.45
Con. Virginia	1.10
Crown Point	.61
Gould & Curry	.12
Hale & Norcross	.16
Mexican	1.80
Occidental	.45
Ophir	1.07
Overman	.25
Potosi	.25
Savage	.15
Sierra Nevada	.23
Union Con.	.47
Yellow Jacket	.38

Name of Comp.	Bid.
MISC. NEV. & CAL.	
Belmont	6⅛
Jim Butler	.26
MacNamara	.14
Midway	.13
Mont.-Tonopah	.92
North Star	.06½
West End Con.	.50
Atlanta	.13
Booth	.08
C.O.D. Con.	.10
Comb. Frac.	.12
Jumbo Extension	.39
Oro	.03
Silver Pick	.06
St. Ives	.10
Tramps Con.	‡.03
Argonaut	1.50
Bunker Hill	‡6¼
Cent. Eureka	1.40
So. Eureka	6½

N. Y. EXCH. Mar. 7

Name of Comp.	Clg.
Amalgamated	62⅜
Am. Agri. Chem.	57½
Am.Sm.&Ref.,com	74⅜
Am. Sm. & Ref., pf.	105⅛
Anaconda	38⅛
Batopilas Min.	2
BethlehemSteel pf	61
Federal M. & S., pf.	57
Goldfield Con.	7
Great Nor., orectf.	59¼
Homestake	84½
Nat'nalLead,com.	53½
National Lead, pf.	106
Nev. Consol.	18⅞
Pittsburg Coal,pf.	74
RepublicI&S,com.	33
Republic I & S, pf.	98⅝
SlossSheffi'd,com.	52
Sloss Sheffield, pf.	‡110¾
Tennessee Copper	37½
Utah Copper	44½
U. S. Steel, com.	76½
U. S. Steel, pf.	118⅛
Va. Car. Chem.	68

N. Y. CURB Mar. 7

Name of Comp.	Clg.
Ariz.-Cananea	‡3⅜
Barnes King	⅛
Braden Copper	3⅞
B. C. Copper	6
Buffalo Mines	‡2.15
Butte Coalition	17½
Caledonia	⅛
Calumet & Mont.	‡.10
Chino	21⅜
Cobalt Central	.08¾
Con. Ariz. Sm.	1
Davis-Daly	1⅜
Ely Con.	.27
El Rayo	‡2⅛
Florence	2⅛
Giroux	6⅛
Greene Cananea	6
Greenwater	.05½
Guanajuato	3⅜
Guerrero	‡1⅛
Guggen. Exp.	200
Inspiration	7½
Internat. S. & R.	‡131
Kerr Lake	6½
La Rose	4¾
McKinley-Dar-Sa.	1
Miami Copper	19⅜
Mines Co. of Am.	5⅜
Mont. Shoshone	‡.10
Nev. Utah M. & S.	
Nipissing Mines	10
Ohio Copper	1⅝
Pacific Sm. & M.	¼
Precious Metals	1⅜
Ray Central	1⅜
Ray Con.	17¼
Red Warrior	1½
South Utah M. & S.	
Standard Oil	628
Stewart	.78
Tonopah	8¼
Tonopah Ex.	1.24
Tri-Bullion	½
Tularosa	9
Union Mines	¼
Yukon Gold	3⅞

LONDON Mar. 8

Name of Com.	Clg.
Camp Bird	£1 13s 0d
Dolores	1 10 0
El Oro	1 5 0
Esperanza	1 13 9
Mexico Mines	7 7 6
Oroville	0 7 6
Stratton'sInd.	0 2 0
Tomboy	0 15 6

BOSTON EXCH. Mar. 7

Name of Comp.	Clg.
Adventure	5⅛
Algomah	7
Allouez	34½
Am. Zinc	23⅛
Arcadian	‡3
Arizona Com.	15
Atlantic	4
Bonanza	½
Boston & Corbin	13
Butte & Balak	5
Calumet & Ariz.	51¾
Calumet & Hecla	480
Centennial	13
Con. Mercur	.06
Copper Range	66
Daly-West	3½
East Butte	12⅜
Franklin	9½
Granby	33
Hancock	22¾
Hedley Gold	15
Helvetia	1⅝
Indiana	12¾
Isle Royale	13½
Keweenaw	2
Lake	36
La Salle	4¾
Mass	6¾
Michigah	2½
Mohawk	43½
New Arcadian	27⅛
North Butte	28⅞
North Lake	6½
Ojibway	6½
Old Dominion	39
Osceola	110
Parrot	12
Quincy	68
Shannon	11½
Shattuck-Ariz	20½
Superior	36⅝
Superior & Bost.	4
Superior & Pitts.	15
Tamarack	40¾
Trinity	4½
U. S. Smelting	34¾
U. S. Smelt'g, pf.	47
Utah Apex	2½
Utah Con.	13⅝
Victoria	1½
Winona	8¾
Wolverine	120
Wyandot	‡1¼

BOSTON CURB Mar. 7

Name of Comp.	Last.
Ahmeek	170
Bingham Mines	2½
Boston Ely	.87
Boswyocolo	.07½
Cactus	.20
Calaveras	2.06½
Champion	.02
Chief Cons	1.25
Corbin	3.75
Cortez	2.25
Crown Reserve	2⅜
First Nat. Cop.	2.06½
Live Oak	18¾
Mackinaw	.07
Majestic	.29
Nat'l Mine & Ex.	.03
Nevada-Douglas	2
Oneco	1½
Raven Copper	.21
Rhode Island Coal	4⅞
San Antonio	5
South Lake	5⅞
Trethewey	1
Tuolumne Copper	4⅜
United Zinc, pfd.	4½
Vulture	.07½
Yuma	.20

‡Last quotation.